

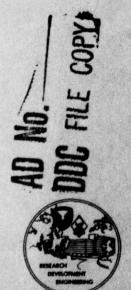


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TR-1819—Implementation of the Device Data Bank on the HDL IBM Computer, by Thomas V. Noon

Implementation of the Device Data Bank on the HDL IBM Computer

October 1977





U.S. Army Materiel Development and Readiness Command HARRY DIAMOND LABORATORIES Adelphi, Maryland 20783

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1. INTRODUCTION

The effects of high-altitude electromagnetic pulses (HEMP) from nuclear weapons deployed at high altitudes can seriously degrade tactical weapon and communication systems vitally needed by the field Army prepared to fight a conventional and nuclear war. The Multiple Systems Evaluation Program (MSEP) was established to determine both the vulnerability of and the means for hardening many of these Army tactical systems to an HEMP environment. An essential step in the program is to develop analytic tools (such as computer programs for predicting transient data and system response) to evaluate system susceptibility to HEMP. These computer programs have been gathered into an applications package titled Generic Assessment Methods for a Priori Hardening of Systems (GAMPHS). The GAMPHS application for the vulnerability and hardness assessment of systems covered by MSEP uses the programs described in this report in addition to other computer programs (see fig. 1).

This report describes one aspect of the effort by the Harry Diamond Laboratories (HDL) to convert ${\tt DAMTRAC}^2$ (Damage Analysis Modified Transient Radiation Analysis by Computer) and the Device Data Bank* (consisting of files of diodes and transistors with their equivalent-circuit parameters and damage data) from the Mobility Equipment Research and Development Command CDC computer to the HDL IBM 370/168 computer. The transmutations and modifications required to convert DAMTRAC are basically transparent to users of the CDC version of DAMTRAC except for the control language which directs the job execution (the job control language (JCL) for DAMTRAC is presented in app A). However, the conversion of the Device Data Bank files required the restructuring of the data files and the development of new programs to manage and maintain the data files, and to access and retrieve device data from these files. The file structure, management programs, and access method is discussed in detail in this report. Sufficient information about the software described in this report is provided to allow a programmer experienced in IBM FORTRAN and JCL and in the use of DAMTRAC to use the programs and concepts. Complete listings of the device libraries and parameter references are presented in section 5.

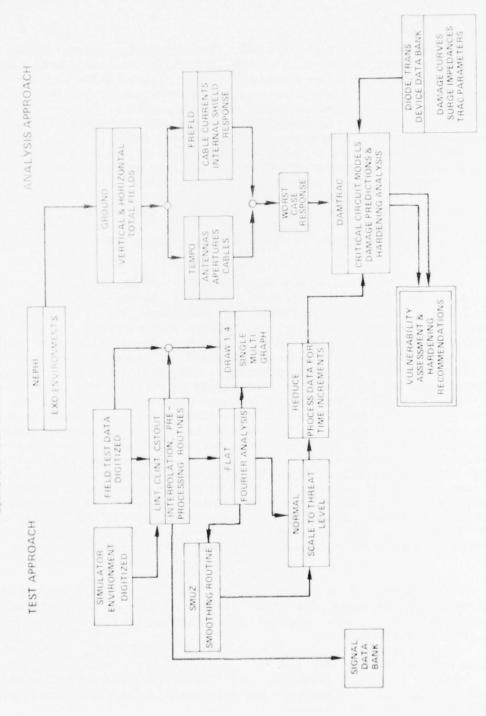
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¹George Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1--Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)

²George Baker et al, Damage Analysis Modified TRAC, Harry Diamond Laboratories TM-76-6 (May 1975).

^{*}Charles P. Ruzic, Extension and Interfacing the MSEP Semiconductor Damage Data Bank for Analysis and Retrieval by DAMTRAC, Harry Diamond Laboratories TR-1821 (December 1977).

MULTIPLE SYSTEMS EVALUATION PROGRAM COMPUTER PROGRAM FLOW IN VULNERABILITY ASSESSMENT



The GAMPHS application in vulnerability and hardness assessment. Figure 1.

2. DESCRIPTION OF THE DEVICE DATA BANK FILES

The Device Data Bank files are a collection of the equivalent-circuit values and damage parameters of different diode and transistor types stored by their device names. The equivalent-circuit and damage parameters are used as input for circuit analysis and for calculations of circuit damage due to EMP (electromagnetic pulse) by programs such as DAMTRAC and NET2. The existence of these files reduces the input data required by the circuit-analysis program by allowing the program users to specify only a device name. The circuit-analysis programs then search the Device Data Bank file for the device parameter.

The Device Data Bank files were created at HDL, using the IBM direct access file structure. The direct access file structure allows for access and modification of multirecord files at random without regard for the records' physical location. This random selection of records is a very desirable attribute for files of data which are retrieved by name keys (such as diode and transistor types).

2.1 Diode Device Library

The Diode Device Library is a direct access file with space reserved for 300 different diode types. Each diode type has space reserved for 19 device parameters, 11 parameter references, and a status flag. The 19 device parameters consist of the 7 TRAC³ equivalent-circuit values and 12 device-damage values (4 presently unused). The definition of the diode device parameters is given in table I (p 8). The parameter references (see sect. 5) refer to the origin of the TRAC values and the last 10 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

2.2 Transistor Device Library

The Transistor Device Library is a direct access file with space reserved for 300 different transistor types. Each transistor type has space reserved for 40 device parameters, 10 parameter references, and a status flag. The 40 device parameters consist of the 16

³E. D. Johnson et al, Transient Radiation Analysis by Computer Program (TRAC), Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).

TABLE I. DEFINITION OF DIODE EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES

Note: $P = power to damage; \tau = pulse duration$

Symbol	Definition
IS	Reverse saturation current*
MD	Proportionality constant*
RDL	Leakage resistance*
CDO	Junction capacitance constant*
VDB1	Diffusion or built-in voltage*
TD	Diode time constant*
IPPD	Primary photocurrent constant*
VB	Breakdown voltage*
Surge Z	Reverse surge impedance*
R Bulk Forward	Forward bulk resistance
Surge Z	Reverse surge impedance for 1-µs square pulse
Rev I µs	
Surge Z	Reverse surge impedance for 10-µs square pulse
Rev 10 µs	
K Damage	Measured reverse damage constant (τ<50 ns) K=Pτ
Rev <50 ns	
K Damage	Measured reverse damage constant (τ >50 ns) K=P τ ²
Rev >50 ns	
K Damage	Measured forward damage constant using K=Pt
Forward	
K	Not used, available of other damage constants

^{*}Used by DAMTRAC for diode model.

TRAC³ equivalent-circuit values and 24 device-damage values (6 presently unused). The definitions of the transistor device parameters are given in table II. The parameter references (see sect. 5) refer to the origin of the last 20 damage values. The status flag (titled TRAC FLAG on the listings of the device library) indicates whether the proper TRAC equivalent-circuit values are defined for use of the device library entry by the DAMTRAC circuit-analysis program. If the TRAC FLAG is set to 1, all the necessary device parameters have been defined; if the TRAC FLAG is set to 0, all the necessary device parameters have not been defined and therefore cannot be used as input for DAMTRAC runs.

 $^{^3}E.\ D.\ Johnson$ et al, Transient Radiation Analysis by Computer Program (TRAC), Autonetics Division of North American Rockwell Corp., AD 836683 (June 1968).

TABLE II. DEFINITION OF TRANSISTOR EQUIVALENT-CIRCUIT VALUES AND DAMAGE VALUES.

Note: $P = power to damage; \tau = pulse duration$

Symbol	Definition
HFEN	Normal common-emitter current gain*
HFEI	Inverse common-emitter current gain*
TN	Emitter-time constant*
TI	Collector-time constant*
ICS	Collector reverse-saturation current*
MC	C-B proportionality constant in exponent*
CCO	C-B junction capacitance at zero bias*
VCBI	C-B junction-diffusion potential*
RCL	C-B leakage resistance*
IES	Emitter reverse-saturation current*
ME	E-B proportionality constant in exponent*
CEO	E-B junction capacitance at zero bias*
VEBI	E-B junction diffusion potential*
REL	E-B leakage resistance*
IPPC	Primary photocurrent for the collector-base junction*
IPPE	Primary photocurrent for the emmitter-base junction*
C-BBDV	C-B breakdown voltage*
E-BBDV	E-B breakdown voltage*
Surge ZC	C-B reverse surge impedance (0.1-µs pulse width)*
Surge ZE	E-B reverse surge impedance (0.1-µs pulse width)*
Bulk Resistance C-B	Junction forward bulk resistance
Bulk Resistance E-B	Junction forward bulk resistance
Z Surge C-B 1 µs	Reverse surge impedance (1-µs pulse width)
Z Surge C-B 10 µs	Reverse surge impedance (10-us pulse width)
Z Surge E-B 1 µs	Reverse surge impedance (1-µs pulse width)
Z Surge E-B 10 µs	Reverse surge impedance (10-us pulse width)
Damage K (<50 ns)C-B	Reverse biased damage constant (T<50 ns) K=PT
Damage K (<50 ns)E-B	Reverse biased damage constant (T<50 ns) K=PT
Damage K (>50 ns)C-B	Reverse biased damage constant (τ>50 ns) K=P2
Damage K (>50 ns)E-B	Reverse biased damage constant (τ >50 ns) K=P ^{$\frac{1}{2}$}
K Forward C-B	Forward biased damage constant K=PT
K Forward E-B	Forward biased damage constant $K=P_T$
K	Available for other damage constants

^{*}Used by DAMTRAC for transistor model.

3. MANAGEMENT PROGRAM FOR THE DEVICE DATA BANK--MPD2B

3.1 Description of MPD2B

To simplify and minimize the effort necessary to manage and maintain the Device Data Bank, only one program, MPD2B, is required to create, update, add to, and list the device libraries. Through the use of action requests and action control cards as part of the required input data to the program, any of the above-mentioned functions can be performed on either or both device libraries in one job. Each action request specifies the action to be taken and the library to which the action refers. The action requests for the device libraries are as follows.

For the Diode Device Library:

- (1) CREATE DIODE FILE
- (2) UPDATE DIODE FILE
- (3) ADD TO DIODE FILE
- (4) LIST DIODE FILE

For the Transistor Device Library:

- (1) CREATE TRANSISTOR FILE
- (2) UPDATE TRANSISTOR FILE
- (3) ADD TO TRANSISTOR FILE
- (4) LIST TRANSISTOR FILE

The action control cards, END OF ACTION and FINISH, are required to terminate one action request (CREATE, UPDATE, ADD TO) and either prompt the program for another action request or signal the end of the job. For all action requests and action control cards, the command (CREATE, UPDATE, ADD TO, LIST, END OF ACTION, FINISH) must begin in column 1 of the data card, and for action requests specifying a file name (CREATE, UPDATE, ADD TO, LIST), the file name (DIODE FILE, TRANSISTOR FILE) must begin in column 8 of the data card. Improper coding of an action request or action control card causes the job to stop with a user-supplied STOP code of 1.

3.2 Description of the Action Requests

3.2.1 CREATE

The action request CREATE must be the first action request for either device library. The CREATE action request establishes the file definition requirements and writes the supplied device data onto the file beginning at the second record and continuing onto subsequent records for each different device name until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the record index and the date of the creation run are written onto the first record for use by the LIST action requests.

3.2.2 UPDATE

The UPDATE action request is used for changing parameter values previously defined or for defining new parameter values for devices already in the pertinent device library. Device data are read and the appropriate device record updated until an END OF ACTION control card is encountered. An UPDATE flag and the date of the update run are then written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

3.2.3 ADD TO

The ADD TO action request is used for adding new device entries to a device library. Device data are read with each new device added to the next available record in the file until an END OF ACTION control card is encountered. After the END OF ACTION control card is read, the new record index, an ADD TO flag, and the date of the add run are written onto the first record for use by the LIST action request to indicate the last action performed on the device library.

3.2.4 LIST

The LIST action request is used for listing the devices, device parameters, parameter references, and TRAC flag that are stored in a device library. Each device name is listed along with its associated parameter values. The devices are listed in the IBM collating sequence starting with the first character of the device name. In addition to the list of devices, a title page is printed giving the name of the device library (i.e., Diode Device Library, Transistor Device Library), the current date, the library creation date, and the last action request of the file (if any) and its date. The words "End of Listing" are printed after the last device to signify the end of the listing. The LIST action request should be the last action taken on a file after every run of the MPD2B program. Also, the LIST action request as the LIST action request does not need to be followed by an END OF ACTION action request as the LIST action request does not read any data from the input stream.

3.2.5 END OF ACTION

The END OF ACTION action control card is used to terminate the input data to an action request (CREATE, UPDATE, ADD TO). An END OF ACTION card must follow the input data for all the previous action requests. An END OF ACTION card is not required after the LIST action request since there are no input data to this command.

3.2.6 FINISH

The FINISH action control card terminates the input data for the MPD2B program. The FINISH action control card must be the last card of the input data.

3.3 Device Data Entry Format

3.3.1 Diode Device Library

To enter diode device data into the Diode Device Library, four data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table I, sect. 2 for definitions of parameters) and formats:

```
Card 1: Device Name, IS,
                      RDL,
                      CDO,
                      VDBI,
Card 2: Device Name, IPPD,
                      VB,
                      Surge Z,
                      R Bulk Forward,
                      Surge Z Rev 1 µs,
                      Surge Z Rev 10 µs
Card 3: Device Name, K Damage Rev <50 ns,
                      K Damage Rev >50 ns,
                      K Damage Forward,
                      Κ,
                      Κ,
                      K
Card 4: Device Name, K,
                      TRAC Ref,
                      R Bulk Forward Ref,
                      Surge Z Rev 1 µs Ref,
                      Surge Z Rev 10 µs Ref,
                      K Damage Rev <50 ns Ref,
                      K Damage Rev >50 ns Ref,
                      K Damage Forward Ref,
                      K Ref,
                      K Ref,
                      K Ref,
                      K Ref
```

```
Format for Cards 1, 2, and 3: (3A4, 3X, 6E10.3)

Format for Card 4: (3A4, 3X, E10.3, 6X 11 (1X, I3))
```

Sample diode data set: (see fig. 2, p 14)

```
Diode type 1N1202
IS = 4.25 \times 10^{-10}
                        Surge Z = 64
MD = 1.62
                         R Bulk Forward = 1, Ref No. 25
RDL = 4.13 \times 10^{10}
                        Surge Z Rev 1 \mus = 65, Ref No. 25
CDO = 1.3 \times 10^{-11}
                        Surge Z Rev 10 \mus = 65, Ref No. 25
VDBI = 1
                         K Damage Rev <50 ns = not defined
TD = 1 \times 10^{-7}
                        K Damage Rev >50 ns = 14, Ref No. 25
 IPPD = 1 \times 10^{-4}
                        K Damage Forward = not defined
VB = 200
                        TRAC Ref = not defined
```

For UPDATE action requests, all four data cards for the device being updated must be used as input. All parameter values and parameter reference values which were previously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

3.3.2 Transistor Device Library

To enter transistor device data into the Transistor Device Library, seven data cards are required for each different device. Each data card contains the device name in columns 1 through 12, with the name left justified; the remainder of each card contains the appropriate values for the parameters and parameter references according to the following order (see table II, sect. 2 for definition of parameters) and formats.

```
Card 1: Device Name, HFEN,
                       HFEI,
                       TN,
                       TI,
                       ICS,
Card 2: Device Name, CCO,
                       VCBI,
                       RCL,
                       IES,
                       ME,
                       CEO
Card 3: Device Name, VEBI,
                       REL,
                       IPPC,
                       IPPE,
                       C-BBDV,
                       E-BBDV
```

INIZOZ	1. 1452E-09 11162E+011 1.4113E+111 1.1130E-110. 1.1100E+101100E-061
W112021	1.006-036506+03650E+03650E+02
MILIZOZU I I I I I I	: //woens
N11202111	25 25

Figure 2. Sample diode data set.

```
Bulk Resistance E-B,
                               Z Surge C-B 1 us,
                               Z Surge C-B 10 us
       Card 5: Device Name, Z Surge E-B 1 us,
                               Z Surge E-B 10 us.
                               Damage F (<50 ns) C-B,
                               Damage K (<50 ns) E-B,
                               Damage K (>50 ns) C-B,
                               Damage K (>50 ns) E-B
       Card 6: Device Name, K Forward C-B,
                               K Forward E-B,
                               К С-В.
                               K E-B,
                               K C-B.
                               K E-B,
       Card 7: Device Name, Bulk Resistance Ref,
                               Z Surge C-B Ref,
                               Z Surge E-B Ref,
                              Damage K (<50 ns) Ref,
                               Damage K (>50 ns) Ref,
                               K Forward Ref,
                               K Ref,
                               K Ref
Format for Cards 1, 2, 3, 4, 5, and 6: (3A4, 3X, 6E10.3)
Format for Card 7:
                                           (3A4, 10(1X, I3))
      Sample transistor data set: (see fig. 3)
 Transistor type 2N705
  HFEN = 25
                       C-BBDV
                                             = 15
  HFEI = not defined E-BBDV
                                             = 3.5
  TN = 1.06 \times 10^{-9}
                                             = 72.5
                       Surge ZC
  TI = 5.03 \times 10^{-8} Surge ZE
                                             = 165
                       Bulk Resistance C-B = 0.95 | Ref No. 34
  ICS = 10^{-5}
  MC = 1.83
                       Bulk Resistance E-B = 2.2 |
  CCO = 1.37 \times 10^{-11} \text{ Z Surge C-B 1 } \mu \text{s} = 150
                                                      Ref No. 34
  VCBI = 0.3
                       Z Surge C-B 10 µs
                                             = 360
  RCL = 10^7
                       Z Surge E-B 1 µs
                                            = 340
                                           = 340
  IES = 10^{-5}
                       Z Surge E-B 10 µs
                       Damage K (<50 ns)C-B = 3.18 \times 10^{-6} Ref
  ME = 1.83
 CEO = 6.39 \times 10^{-12} Damage K (<50 ns)E-B = 1.13 \times 10^{-6} No. 60
                       Damage K (>50 ns)C-B = 1.42 \times 10^{-2}
  VEBI = 0.3
                       Damage K (>50 ns)E-B = 5.06 \times 10^{-3} No. 60
  REL = 10^7
  IPPC = 10^{-3}
                       K Forward C-B = 7.9 \times 10^{-5} | Ref
                                            = 3.6 \times 10^{-5} No. 60
  IPPE = 10^{-5}
                       K Forward E-B
```

Card 4: Device Name, Surge ZC,

Surge ZE.

Bulk Resistance C-B,

5 mm mol.	04 75 70 77 79 80
2M.205	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2N17051183.Et all	
24/2081	
201705	0.3
2N/705	0.61
2M705	
24/705.	

Figure 3. Sample transistor data set.

For UPDATE action requests, all seven data cards for the device being updated must be used as input. All parameter values and parameter reference values which were preciously defined must be present on the data cards because the entire record is updated from the input data cards. The reason for this requirement is to make the maintenance of a hard copy of the device library less of a chore for the Device Data Bank manager.

3.4 Program Messages Issued by MPD2B

The following messages are printed during the execution of the MPD2B program.

*****ERROR ON INPUT CONTROL CARD *****JOB TERMINATED

This message is printed when an action request card is not recognized. The job is terminated. This message is accompanied by a STOP 1.

****DATA FOR X DEVICES SUCCESSFULLY WRITTEN ON DEVICE SET Y

This message is printed at the completion of a successful CREATE run. Here, X is the number of devices written on the file and Y is the device set where the data were written (ll for the diode file and 12 for the transistor file).

*****UPDATING OF THE DIODE FILE COMPLETED

*****UPDATING OF THE TRANSISTOR FILE COMPLETED

These messages are printed at the completion of a successful UPDATE run.

*****DEVICES SUCCESSFULLY ADDED TO DIODE FILE

or

*****DEVICES SUCCESSFULLY ADDED TO TRANSISTOR FILE

This message is printed at the completion of a successful ADD TO run.

*****END ENCOUNTERED UNEXPECTEDLY ON INPUT

This message is printed if an end of record card is read during the input of data. This message is accompanied by a STOP 1.

*****DEVICES NAMES DO NOT MATCH FOR DEVICE X (Y)

This message is printed if the device names do not match while the input data cards for a particular device are read. Here, X is the device name first read and Y is the device name read which did not match. This message is accompanied by a STOP 1.

*****DEVICE NAME NOT LOCATED IN DIODE FILE

or

*****DEVICE NAME NOT LOCATED IN TRANSISTOR FILE

These messages are printed during an UPDATE run if the device to be updated is not located in the file. This message is accompanied by a STOP 3.

*****DEVICE X IS ALREADY IN THE DIODE DEVICE DATA FILE (ITEM No. Y)

or

*****DEVICE X IS ALREADY IN THE TRANSISTOR DEVICE DATA FILE (ITEM No. Y)

These messages are printed during an ADD TO run if device X, to be added to the file, is already in the device file. The item Y is the location of the device on a current listing of the file.

*****INDEXING ERROR WHILE UPDATING DIODE DEVICE DATA FILE

*****INDEXING ERROR WHILE UPDATING TRANSISTOR DEVICE DATA FILE

*****INDEXING ERROR WHILE ADDING TO DIODE DEVICE DATA FILE

*****INDEXING ERROR WHILE ADDING TO TRANSISTOR DEVICE DATA FILE

*****INDEXING ERROR WHILE LISTING DIODE DEVICE DATA FILE

*****INDEXING ERROR WHILE LISTING TRANSISTOR DEVICE DATA FILE

These messages are printed if the indexing key stored with the file has been corrupted. The indexing key is checked for the UPDATE, ADD TO, and LIST action requests. A CREATE run for the particular file is recommended. This message is accompanied by a STOP 2.

*****END OF JOB

This message is printed after the FINISH action request has been processed.

3.5 Sample Action Requests

The following are sample action request input data for MPD2B. The last action request to any device file for any run should by the LIST action request.

Sample action request input for a CREATE run CREATE DIODE FILE (enter diode device data)
END OF ACTION
LIST DIODE FILE
FINISH

It should be noted that the action requests to the diode or transistor data files can be used in any order and do not have to be grouped by file types.

4. INTERFACING DEVICE DATA BANK WITH DAMTRAC

The interfacing of the IBM versions of the Device Data Bank and DAMTRAC was accomplished in much the same manner as was used in the CDC versions. Circuit piece-part data decks constructed for use with the MERADCOM CDC version of DAMTRAC require no changes to be used as input for the HDL IBM version. The manner of requesting the device parameter to be read from the Device Data Bank has remained the same; "device name/R" states that the device parameters do not follow but must be read from the appropriate device library. Only the supporting subroutine which retrieves the appropriate device parameter is different.

The subroutine OPENDA with entry points READDA and WRITDA was written to provide DAMTRAC with the proper access method to the Device Data Bank. Subroutine OPENDA contains the DEFINE FILE statements for the Diode and Transistor Device Libraries and the CALL to OPENDA fills and orders a table of device names for both device libraries. The CALL to READDA locates the device in the appropriate device table for which the parameters have been requested, and reads the requested device parameter into a DAMTRAC supplied array. Before returning to DAMTRAC, the TRAC FLAG for the device is checked. If all the necessary device parameters for the DAMTRAC analysis calculation are not defined (TRAC FLAG set to 0) a message is written on the line printer to notify the user of that fact and the job is terminated. However, if all the necessary device parameters are defined (TRAC FLAG set to 1) the device

parameters are returned to DAMTRAC. To maintain the integrity of the device libraries, the ability to enter device parameters into the device libraries from DAMTRAC was not implemented on the IBM version; however, to maintain compatibility with the DAMTRAC and TRAC manuals, a CALL to WRITDA is executed when a request to enter device parameters is encountered. The CALL to WRITDA writes a message on the line printer notifying the user that data cannot be written in a device library and then returns to DAMTRAC.

5. LISTING OF DIODE AND TRANSISTOR DEVICE LIBRARIES

To aid the EMP damage analyst, this section presents listings of the devices contained in the device libraries. Table III of the section gives parameter references found in the diode device library--for example, code 034 of table III is shown in the library as (34).

DIODE DEVICE LIBRARY

PAGE 1

DEVICE NAME			1	0	RDL	1 6	000	0	V081	1 0	10		1990		V B	SURGE Z		TRA	(TRAC REF)
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103	5 9		-	• 0	1.004.00	• 0	1.136-03	+ 0	5.066+00	+ 0	B.08F-03	• 0		+ 0	• 0		+ 0	i	1 1
		0 (75)	(34)	0	(34)		(60)		(90)						0		0		
M01054	6	0		19		0		o		0				0	0	4.50E+03	• 603	-	61.1
					1		1						1 1 1 1 1			1	•	i	
. 60	9 6	1.30t-01 o	1.100.03	9 a	1.508+34	0 0	(60)	0 0	3.016-02 (60)	0 0	6.70E-03 (0 0		• •	0 0		0 0		
MS 1040	0	Q.		0		0		a		4					0	5.75€+01	+01	_	611
				•	1 1 1 1		1 1 1										•	i	
(0)	0 0	6.403.00 9	5.758+01	0 0	3.938.01	0 0	8.496-08	6 9	3.80E-04	0 0	2.10E-06 :			0 0	6 0		• •		
PC115		\sim	1.398	0	10	e ·	2.59E-11	0	7.006-01	o .	1.00f-07	0 .	1.00f-04		1.356+02 0	4.70€+01	+01 .	7	611
(1)	. 0	1.558-01 *			1.20F+02	• 0	1 1 1	• 0	1	+ 0								i	
		(33) 0	(33)	i)	(33)	0		0		o					•		•		
STEP	0	\$ 60-300°1	2.00E +00	0	1.00E+09	0	1.006-12	0	7.50E-01	0	1.00E-08			æ	8.60E+01 .	1.00 E-02	-05 0		
				+		+			1 1 1 1			_					•	i	
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INCRAP		03	1.23	o	1.236+03	ò	1.236+03	0	1.236+03	0	1.235+03 •		1.236 +03		1.23E+03 ·	1.23 8+03	• 60+		
(1)	. 0	• 0	1	• 0	1	• 0	1 1 1	+ a	1	+ 0					• 0	1	• •		
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DIODE DEVICE LIBRARY (Cont'd)

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1745000	0000	50 1		1.846	0 + 0 0	1,601+09	0 + 0 0	2,246-12	0 . 0 0	10-100	0 + 0 0	1,00E-06		1.00E-04	2.1	7.506+01	2.10	2.10++01		
11/62/206		5.156-11	0 + 0 0	• 61E • 00	5 + 5 B	5.006+08	0 + 0 0	7.181-13	0 + 0 0	1.046.400	0 + 0 0	7.08 E-10	-	0 700 E - 0 7	3.0	3.00E.01 .	2.10	2.10£+01		
11/57/60		00 - 1	0 + 0 0	1.556.00	0 + 0 0	5.601.08	0 + 0 0	2.12F-12	0 + 0 0	8 - 10 - 11	0 + 0 0	1.206-07	9-4	* * * * * * * * * * * * * * * * * * *	2.1	1.50E+02 •	2.106+	2.106+01		
0050501		5.971-14		1.002 +00	0 + 0 0	5.701.05	0 + 0 0	1.41E-09	0. + 0.0	10-300-01	0 + 5 5	.591-05	P4	1.00E-04	4	4.00E+02 *	2.10	2.10E+01		
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1805 2054	2000	1.17:-12		.196.00	0 + 0 0	1.15++10	0 + 0 0	07-3-07-1	0 • 0 0	8.00F-01	0 + 0 0	3.266-07	**	7006-04	8 10	5.006.01	2.10	2.106.01		
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18UR 2050		3.936-11	- '	1.286+00	0 + 0 0	906.1	0 + 5 9	8.45[-11	0 + 0 0	8 .20E-01		3.00E-07	-	1.00E-04 *	2 . 0	5.00E+01	2.10	2.106.01		

DIODE DEVICE LIBRARY (Cont'd)

# # # # # # # # # # # # # # # # # # #	DEVICE NAME	1 4	1.5	Q.	0	ROL	0	CDU	0	VD81		10		• 0dd1		e 8 A	7 3	STRAC REF
			1 1 1 0			C118 C.E. 7	+ 0	1	+ 0	K DAMAGE	* o	DAMAGE	+ 0	+ 0		* 0	· ·	×
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2.09E-11	NUR 20 50	.0	5.628-11	-		9.30E+0	0	1.166-10	0	9.00£-01	7	4.538-07	6	1.00E-04 °		5.00E+01 °	2.10E+01 °	
2.09E-11		9 1	1				+ 0	1 1 1	+ 0		+ 0	1 1 1 1	+ 0	+ 0		+ 0		1
2.09fe-11	(1)				0		o		6		0		0	0		0	0	
7.07f-11			* 000			0 a		1.086-10	0	8 -50F-01	0	3.05F-07	0	1.00E-04 °		5.00E+01 °	2.10E+01 °	
7.07f-11	AUN COSE		17.036.7	4								1 1 1					1	-
7.07f-11 0 1.34f-00 0 7.10f-09 0 1 1.07f-09 0 1 1.34f-00 0 7.10f-09 0 1 1.34f-00 0 1.00f-09 0 1 1.00f-09 0 1.00f-09 0 1 1.00f-09 0 1.00f-09 0 1 1.00	(11)	17 10		6.0	0 0		0 0		0 0		0 0		0	d		G		
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1) 2.10E-15 0 1.10E-00 0 1.00E-09 0 1 1.79E-00 0 1.79E-00 0 1.79E-10 0 1.79E-	1111				+ 6	1 2 2	+ 6		+ 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	+ 0	1 1	+ a	. 0	. 0	0		
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1)																		
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0 1,10E-01 0 1,13E+03 0 2,95E+03 0	N120248		4.52E-10						0	1.00E+00		1.008-07		1.001-04	0 +	2.00E+02 °	1.136+03	(72)
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1000			(62)		0 ((34)	0	109 1	9	(60)	0		0	(13)		0		0

DIODE DEVICE LIBRARY (Cont'd)

1.055-16 1.055-00 1.255-10 1.255-10 1.055-00 1.005-07 1.005-07 1.005-07 1.105-01 1.105-01 1.105-01 1.105-07 1.005-07 1.105-01	DEVICE NAME	0 1	1.5	0	Q.X	q	RDL	9	CDO	0	VOBI	0	10		. Odd1	V.	1 0	SURGE 7	10	(TRAC DEC
### ### ### ### ### ### ### ### ### ##	TRAC FLA		R BULK		SURCE 2	+ 0	SURGE Z	* o	DAMAGE	* o		* · ·	DAKAGE		* o					
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11.05f-16 1.05f-00 2.58f-10 2.60f-10 8.50f-01 2.15f-07 1.00f-04 8.75f-00 2.10f-01 1.00f-04 1.00f-04 8.75f-00 2.10f-01 1.00f-13 1.00f-14 1.																	1	2 2 3 5 5 6 5 8		1
2.05f-14 1.03f-00 1.28f-10 2.58f-10 8.50f-01 1.94f-07 1.00f-04 8.75f-00 2.10f-01 1.05f-14 1.03f-00 1.28f-10 2.49f-10 8.50f-01 1.94f-07 1.00f-04 8.75f-00 2.10f-01 1.00f-14 1.03f-00 1.28f-10 2.49f-10 8.50f-01 2.48f-07 1.00f-04 8.75f-00 2.10f-01 1.00f-13 1.00f-13 1.00f-13 1.00f-13 1.00f-14 8.75f-00 2.10f-01 2.49f-10 2.49f-10 2.49f-01	N1204A	0			.62E+00		4.136+10	ø	.30E-11									100		
1.05E-14 1.05E+00 1.70E+10 2.05E+10 2.15E+07 1.00E-04 8.75E+00 2.10E+01 1.00E-14		6					1 1 1 1		1 1 1 1									1.106-01		
1.05E-14 = 1.05E-16 = 1.70E+10 = 2.60E-10 = 8.50E-01 = 1.94E-07 = 1.00E-04 = 8.75E+00 = 2.10E+01 = 2.00E-14 = 1.00E-14 = 1.00E+04 = 1.00E+04 = 8.75E+00 = 2.10E+01 = 1.00E-14 = 1.00E-14 = 1.00E+04 = 8.75E+00 = 2.10E+01 = 1.00E-14 = 1.00E-14 = 1.00E+04 = 8.75E+00 = 2.10E+01 = 1.00E-13 = 1.00E+04 = 8.75E+00 = 2.10E+01 = 2.00E-01 = 2.30E-07 = 1.00E-04 = 8.75E+00 = 2.10E+01 = 2.00E-01 = 2.30E-14 = 1.00E+04 = 8.75E+00 = 2.10E+01 = 2.30E+01 =	3	6 6		0 0		0 0		0 0				0.0						1		
1.00E-14 = 1.03E+00 = 1.70E+10 = 2.00E-10 = 8.50E-01 = 1.04E-07 = 1.00E-04 = 8.75E+00 = 2.10E+01 = 2.00E-01 =																				
2.05f-14 = 1.03f-00 = 1.28f+10 = 4.12f-10 = 8.56f-01 = 1.94f-07 = 1.00f-04 = 8.75f+00 = 2.10f+01 = 1.05f-10 = 1.02f+10 = 2.49f-10 = 8.56f-01 = 2.61f-07 = 1.00f-04 = 8.75f+00 = 2.10f+01 = 1.05f-10 = 1.01f+00 = 1.96f+10 = 2.49f-10 = 8.06f-01 = 2.57f-07 = 1.00f-04 = 8.75f+00 = 2.10f+01 = 2.00f-13 = 1.01f+00 = 1.50f+10 = 2.49f-10 = 8.00f-01 = 2.57f-07 = 1.00f-04 = 8.75f+00 = 2.10f+01 = 2.00f-14 = 1.00f+09 = 4.02f-10 = 8.00f-01 = 2.49f-07 = 1.00f-04 = 8.75f+00 = 2.10f+01 =	V1313A	0 (9	.06€+00	0												2 105.01	4	
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11.30F-10 = 1.95F+30 = 4.86F+09 = 8.57F-13 = 1.28F+00 = 5.79F-09 = 1.00F-04 = 4.00F+01 = 4.82F-10 = 1.48F+30 = 4.13F+10 = 1.30F-11 = 1.00F+00 = 1.00F-04 = 2.00F+01 = 1.30F-11 = 1.00F+00 = 1.00F-04 = 1.00F+01 = 1.30F-11 = 1.00F+00 = 1.00F-04 = 1.00F+01 = 1.30F-11 = 1.00F+00 = 1.00F+01 =	(1)	0 0 0 0	1.58E-09 3.97E-01 (64)		1.686.00							1.00E-07 3.04E-04 (13)					5.00 £ • 00		1
11.30F-10 = 1.62F+30 = 4.13F+10 = 1.30F-11 = 1.00F+00 = 1.00F-07 = 1.00F-04 = 2.00F+02 = 1.30F-10 = 1.30F-10 = 1.30F-11 = 1.00F+00 = 1.00F+07 = 1.00F-04 = 2.00F+01 = 2.30F-11 = 1.00F+00 = 1.19F-06 = 1.00F-04 = 2.00F+01 = 2.30F-11 = 1.00F+00 = 1.19F-06 = 1.00F-04 = 2.00F+01 = 2.30F-11 = 1.00F+00 = 1.19F-06 = 1.00F-04 = 2.00F+01 = 2.30F-11 = 1.00F+00 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 = 1.00F-04 = 1.50F+03 = 2.30F-11 = 1.00F+00 = 1.48F-05 =	11/36.05	0 0 0 0	3.77E-09							1.286.00						.00E+01	2.10£+01		
11)	183611	0 9 0 0	4.52E-10				4.13€+10			1.00£+00		1.00E-07		1.00E-04	~	.00E+02 .	2.10£+01		1
11)	143669	0 0 0 0	1.30F-10	0 + 0 0					2.30E-11			*.64E-07		1.00E-04	_	.00E+01	2.10£+01		1
4.201-09 0 1.761-00 0 2.001-11 0 1.001-00 0 6.821-06 0 1.001-04 0 1.501-03 0 1.501-03 0 1.501-09 0 1.501-09 0 1.201-09 0 3.601-11 0 1.001-00 0 1.481-05 0 1.001-04 0 1.501-03 0 1.501-09 0	(1)	0000	60-300*5									1.196-06	0 + 0 0	1.00£-04	~	.006+01	2.10£+01		1
1) 6 6.208-09 0 1.846+00 0 1.206+09 0 3.606-11 0 1.606+00 0 1.486-05 0 1.006-04 0 1.506+03 0	11,4003		4.201-09		1.766+00		2.006+10	0 + 0 0						1.00E-04	-		1.60E+02		1
	11,4005		60-202-9			0 + 0 6										.506+03	1.20£+02		1

DIODE DEVICE LIBRARY (Cont'd)

SURGE Z SUTRAC REP	(REF) 0 (REF)	1.00 E+02	2.10 + 01 +	2.10 € + 01 +	2.10E+01 •	2.10£+01 •	8,30E+01	3.60 E+00	2.10f+01 •
V8 • • ×	(REF) . (8.00E+02	7.50E+01 0 2.	1.000E+03 ¢ 2.	2.10E+02 ° 2.	1.50E+02 9 2.	2.30£+02 e	2.00E+02 0	3.501.01 0 2
0 + 0	(REF.) o	1.000f-04	1.00E-04 0	1.006-04	7.50E-04 • 7.50E-01 • (25)	0.00 F - 00 F -	0 + 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1,00E-04 ° 9,60E-01 ° 1	1.00E-04 •
TD .	FORMARD	6 . 196-06	1.00f-07 * 1.50f-04 * (13) * *	1,00E-07	4.91E-07 *	1.00£-07 °	5.84E-07	1,006-07	1.00E-07 *
0 + 0.	(REF) o	1.00E+00 • 6 • 60E-01 • 6 • 13)	9.00E-01 • 1.94E-02 • (13) •	1.00£+00 ° 2.40E+00 ° (17)	8.50F-01 ° 1.20F-01 ° (20)	8.50E-01 ° 5.00E-01 ° (17)	8.00E-01 • 5.90E-01 • 6 201	8.50E-01 °	8.50E-01 •
0 + 0	00	2.50E-11	1.20E-12	1,306-11	5.60F-12 •	4.00E-12	1,206-11	4.00E-12 •	4.00E-12 •
0 + 0	0 0	0 + 0 0 0 + 0 0 0 + 0 0	1.548.09	4.13E+10	2.70E+10 •	2,408+11	2.00f.12	2.408.11	2.406+11 0
2 - 0 - 0 2 0 - 0 2 0 2 0 2 0 2 0 2 0 2	REV TUS 0	0 + 0 0	0 0 0 0	3.62E+	1.36E+00 0	306.00	1.416+00 • 6.306+02 • (.24) •	3.608.00 0	1.30E.00 ·
	FURRARD 0	0 + 0 0 0	1.588-09	4.526-10	7.40E-12 0	9.426-12	0 1 0 0	5	9,428-12 0
DEVICE NAME .	. !	11,000	1N4148 0 0 (1) 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	184249	11457	1N455 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	10459	1N459A (1)	18461

DIODE DEVICE LIBRARY (Cont'd)

CRAC REF						* * *		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
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SURGE Z K K (REF)	2.106-01	7.60 € + 02	2.50E+01	3.00 E+01	2,106.01	2.106+01	9.401.01	2.10£+01
0 + 0 0 0	9 + 6 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 • 0 0	0 + 0 0
8 x x 3 x 3 x 5 x 5 x 5 x 5 x 5 x 5 x 5 x	8.00£+01	3.608.01		1.00 E + 02	2.00E.02	2,006.02	4.00E+02	6.00E+02
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2 × 1 × 3 × 1 × 1 × 1 × 1 × 1 × 1 × 1 × 1	1.006-04	1.00E-04	3.00£-01 1.22)	1.00E-04 5.10E-01 (2)	1.00E-04 1.00E+00 (17)	1,006-04	1.00E-04 9.30E-01	1,006-04
0 + 0 0 0	9 + 9 9	0 + 0 0	0 • 0 0	6 + 0 0	0 + 0 0	0 + 0 0	0 * 0 0	0 + 0 0
TD DAMAGE GRMARD (REF)	1.00£-07	1.006-07	9.60E-03 (60)	1.206-06	1.006-07	1.00 € -07	1.00E-07	1.006-07
* * 0 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 * 0 0	0 + 0 0	0 + 0
VOB1 DAMAGE EV >50NS (REF)	8.50E-01 5.00E-02	8.50E-01 9.60E-01 (20)	5.06E-01 (60)	1.00f+00 5.10f-01 (20)	1.006+000 8.53E+00 (12)	1.00F+00 1.00F+00 (17)	1.00F+00 9.30F-01 (20)	1.00E+00 1.21E+01
× 0×	0 + 0 0	0 + 0 0	6 + 0 0	0 + 0 0		0 + 0 0	0 + 0 0	0 • 0
CDC CDC REV CSONS (REV CSONS	4.00E-12	4.00F-12	1,136-04	1.301-11	1.306-11	1.306-11	1.306-11	1.306-11
	0 + 0 0	0 + 0 0	0 + 0 5	0 • 0 0	0 • 0 0	u + 0 0	0 + 0 5	0. * 0
SURGE 2 REV 10US	2.406+11	2.401.11	5.32E+02 (341	4.131.10	4.136.10	4,136+10	4.136+10	4.138.10
0 • 0 0 0	0 . 0 0	0 + 0 0	0 + 0 0	6 * 6 6	0 • 0 0	0 + 0 0	0 + 0 0	0 + 0
SURGE Z SURGE Z REV 1US (REF)	1.3 DF +00	1.30E+00 7.60E+02 (24)	9.62E+02	1.626.00	1.621.00	1.626.00	1.628.00	1.62E+30
0 * 5 9 0	0 + 0 0	0 + 0 0	0 * 0 0	0 • 0 0	0 • 0 0	0 + 0 0	0 + 0 0	0 + 0
1.5 SULN FLRKARD (REF.)	44.	3.421-12	4.631-01	4.52F-10	521-10	4.528-10	4.528-10	01-1251-10
0 0 0 0 0		0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0.00
DEVICE NAME (TRAC FLAG)	18462	114824	194858	1853.7	18536	1N55538 (13)	18540	11867

DIODE DEVICE LIBRARY (Cont'd)

DEVICE NAME		5 - 1	o •			RDL	000	• •	VD81	o +	10		1990	8 1	SURGE 2	. (TRAC REF)
(TRAC FLAG)	0 0 0	R BULN FURNAND (REF.)	0 0 0	SURGE Z REV 1US (REF)	9 9 9	SURGE Z ° REV 10US ° (REF) °	K DAMAGE REV <50NS	000	R DAMAGE REV >50NS (REF)	× +	0		(REF.)	× (3.3	× 4	× 4
90	1	300			1	1	1	1		1		1				
(1)				1.606-02		100.1	7.006-02	. ~	1.00€+00	0 + 0 0	1.00£-12		1.006-04	4.70E.00	7.00 E-02	
1N63	6 6 6 6	2.876-13	0 + 0 0	2.906-01	0 + 9 6	1.00£+06 °	1.416-10	0 + 0 0	5.006-01		1.596-07		1.00£-04	1.00 F+02	2.10£+01	• • • •
13645		4.52f-10 2.25f-01 (34)	6 + 0 9	1.62£.00 6.90E.03 (66)	* * * *	4.13E+10 5 6.90E+03 6	1.30£-11 1.49£-04 (601	0 + 0 0	8.00E-01	0 + 0 0	1.86E-06 ° 6.60E-02 ° (60) ° °		2.80£+00 •	3.63f.00 •	1.75E+03	3
116458	0 0 0 0	5.206-10	9 + 0 9	1.64E+00	a • a •	8.50£+08	2.46E-08	0 + 0 0	8.00F-01	0 + 0 0	1.86E-06		1.00f-04	2.25E+02 •	2.10£+01	
116457	9 9 9 9	5.20E-10	0 + 0 0	1.646.00	0 + 0 0	2.701+10	2.206-12	0 + 0 0	8.006-01	0 + 0 0	1.86F-06		1.00£-04	2.25E.02	8.70E+00	
146452		5.201-10	0 + 0 0	1.64E+00		2.70f+10 °	1.306-12	0 + 0 0	8 .00£-01	0 • 0 0	1.86E-06	- '	1.00E-04	2.25E+02	8.70E+00	
1Ne46 (C)	0 0 0 0	1	0 • 0 0	1		0 + 0 0	!	0 + 0 0	2.295+00							
18646#		2.206-10	0 + 0 0	1.436.00		3.10E+10 •	1.606-11		1.00£+00		9.63E-07 •	- '	1.00E-04	1.446.02	2.106+01	

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																			PAGE 13
DEVICE NAME		1.5	1 0	ď.	1 6	ROL		. 000	1	VD81		10		1990		8	SURGE 2		OTRAC REF.
(TRAC FLAG)		R BULK FORWARD	• 0 0	SURGE 2	+ 0 0	SURGE Z	* 0 0	K DAMAGE .		K DAMAGE	× =	K DAMAGE		× .		*	×	••	×
	a		ū	(REF)		(REF)	0 1	(REF)	1	(REF)		(REF)	. !	(REF) .	-	(REF) o	(REF)	•	CREFI
	1		1																
14c46x	0	1.006-08	0	2.28E+00	0	3.106.10	0	1.60F-11 ·		1.00F +00		1.53E-06		1.00 E-04 .	-	1.44E+02 .	2.10 £ +01	•	
	0 0		+ 0			-	+ 0	• •				1			,				
	•		6		0		9	0						•		•		•	
*******	0	2.206-10	ō	1.436+00	o	3.10f +10	o	1.60E-11 *		1.00E+00	0	7.04E-07		1.00f-04 °	-	1.446.02 .	2.10E.01	•	
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(1)	0 0		0 0		6 6		0 6									•		•	
196461	0	1.006-08	0	2.28E+00	o	3.101.10	6	1.60E-11 ·		1.00E+00	·.	1.12E-06		1.00E-04 ·	-	1.44E+02 .	2.10E+01	• •	
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14647	0 (1.608-09	0	1.768+00	0 .	4.20E+10	0 4	7.70E-12 °		1.00E+00		8.64E-07		1.00£-04 •	4	4.00E+02 *	1.726+01	• •	19
(1)		5-201+60	• 0					4.20E+00		00			. 0	•		•		•	
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IN648	0 0	60-30	0	1.84E+00		5.80f+10	0 1	6.60E-12	0 4	1.00E+00	۰ +	6.641-07		1.001-04	•	* 200 E + 02 -	7.104.01	•	-
(1)	0	1	• 0		. 0		. 0			2.80E+00			0	•		•		•	
	ō		4				0			(11)				•		•		•	
6,59%	0	4.521-10	0	1.626+00	0	4.136+10	0	1.30E-11	0	1.00£ +00	•	3.00£-06		1.00F-04 .	٥	6.00E+02 *	2.10E+01	•	
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14649#	0	1.408-11	o	1.156+00	0	3.601.10	0	1.206-11	•	9.006-01	a	3.26E-06	0	1.00E-04 .	-	1.441.02 .	2.10E+01	•	
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146.01	0	7.405-08	0	2.581.00	o	3.605.00	0	1.206-11	•	9.00E-01	0	7.33E-06	6	1.00E-04 .		1.446+02 .	2.10E+01	•	
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SURGE Z	×	(REF.						1		2.10£+01	1 1		2.10E+01			2.106.01		2.106+01		2.106+01	1	2.10E+01	
	+ 0	0 0			6	۰	0.5 0	+ 0	.0	0 5 0	+ 0	0	010	• 0	۰	0 70		0.50	+ 0 0	010		00	5
80	×	(REF.)		1.444.40			1.44 E+02			1.20E+02			5.00E+01			1.00 F +02		2.001.02		2.00E+01	0 0 8 8 8	5.80£ +00	
0	+ 0	0 0			9	0	0	+ 0	0	0	+ 0	0		. 0	0	0 .		٥	+ 0 0	9	+ 0 0	9 + 1	is.
1990	×	(REF)		1.000-0			1.00 E-04	-		1.00E-04			1.00E-04			1.00E-04	4,40E-01	1.006-04	4.106-01	1.00E-04	[] []	1.001-04	
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10	X DAMAGE	FORWARD (REF)		3.201-00			7.33E-06			1.508-07	1		8.908-08			3.248-07		3.186-09		1.446-08	1	1.00£-07	
0	+ 0	0 0	1		0	o	0	* 0	0	9	+ d	o	0	6	0.	0 4		a	+ 0 0	0	• 0 0	0 + 0	a
VDBI	K DAMAGE	REV >50NS		3.005-0			9.00E-01			1.00E+00	9-20F-01	(2)	8.00E-01			9.00£-01	2.80E+00 (12)	5.00E-01	4.606-01	6.00f-01	1	10-300.6	J. H.H. P. ST.
		0 0			n	a	9	+ 0	0	0	+ 0		0		a ·	0 4	0 0	9	+ 0 0	0	+ 0 0	0 + 0	
000	K DAMAGE	REV CSONS (REF)		0.001-16			8.60E-12			1.80E-12	1 1 1		2.128-11			3.408-12		3.82E-12		7.00E-13	t. 1 1 1	2.506-10	
	+ 0	0 0			0	o		* 0	0	0	+ 0	o	0	• 0	0		0 0	0	+ 0 o	0	• 0 0	9 + 0	0
ROL	SURGE 2	REV 1005 (REF)		1.30000			3.60E+10			6.10E+09	1 1 1		5.601.08			9.90E+08		2.005.07		3.205.05	1	1.000.1	
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ī	SURGE Z	REV 1US (REF)		1.101.0			2.58E+00			1.766+00	1 1		1.156+00			1.82f+00	1.106 •01	9.908-01		1.556+00	1	1.126+00	
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15	R BULK	FURNASO (REF)		1 104.1			7.606-08			3.90€-09	1		1,406-11			4.808-09		8.248-17		7.4.005-07		1.396-13	
	6 0	0.6		1 15	o	0	9	0 0	0	0	a 0	er	6 3	0	o	0 0	0 0	o	0 0 0		0 0 0	0 0 0	2
DEVICE NAME	(TRAC FLAG)			15.00	(1)		1659NI	(1)		IN658	(1)		14659	(1)		14660	(1)	13661	(1)	14695	(1)	IN 706	111

DIODE DEVICE LIBRARY (Cont'd)

SURGE Z SURGE	00 • 1,90 € • 00 • • • • • • • • • • • • • • • •	00 0 5 10 6 + 01	000 - 2,10E+01	• 7.00 E-01 • (61)	+00 0 5.10 0 0 0	-00 % 2.10£+01 %
× + 0 0 0	7.50£+00 	3.6 F + 0.0	3.90E+00	3.87E+00	5.60E+00	• 5.60E+00 • 1.20E+00 • (21)
(REF)	1,00E-04	1.106+00	1.00E-04	1.106+00	1.00E-04	1.00E-04 1.10E+00 (17)
TD DAMAGE ORWARD	1.00 E-07	3.20E-03 o (13)	1.00£-07	9.306-03	1.006-07	3.23E-02 ° (13)
VDB1 VDB1 KEV >SONS	9.00E-01 • 2.10E+00 • 6 2) • 9.00E-01 •	1.60E+00 ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °	9.00E-01 * 1.10E+00 * (17)	1.99E+00 •	9.006-01	9.00E-01 • 1.06E•01 • 1.06E•01 •
CDD	1.00f-18 ·		1.00E-18	4,465-04	1.00£-18	1.00E-18
SURGE 2 O K	1.00 E+18	1.00 E++18	1. 00 F + 18	7.006-01 •	1.000 + 18 · · ·	0.00
SURGE Z + 0	1.12E+00 • • • • • • • • • • • • • • • • • •	1 2 2 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1	1.126+00	7.006-01 •	1756	1.126.00
11	1 39 1 1 1 3 4 6 4 6 4 6 4 6 4 6 4 6 4 6 4 6 6 4 6	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	396 1 1 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.858-01	1396.	0 • 0 0
EVICE NAME O		1N747A (1)	1N748A	1N751A 0	1N752 0	0 A 2 (1)

DIODE DEVICE LIBRARY (Cont'd)

. ITRAC REF	*	(REF)								
	•••	•	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	•
	×	(REF)	4.00 E-01	2.10E+01	5.00 E+00	2.10F+01	2.106+01	2.10F+01	2.10f+01	2.10E+01
	• • •	•	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	• • • •	•
œ >	 x 	(REF.)	6.20E+00	6.80E+00	7.50E+00	\$.20E+00	8.20E+00	1.00£+01	1.00E+01	1.006+01
	• • •	0		• • • •		• • • •				•
0 4 4 1	×	X .	1.00E-04	1.00E-04 6.30E-01 (17)	1.00E-03	1.00E-04 6.30E-01 (17)	1.00 E-04	1.00F-04	1.00E-04 6.30E-01 (17)	1.00E-04
0 4		•	0 + 0 0	. +	0 + 0 0	0 + 0 0				•
2	FORWARD		1.00E-07 2.34E-02 (13)	1.00E-07 6.43E-04 (13)	1,00E-08	1.00E-07 6.87E-02 (13)	1.00 E-07	1.00 6-07	1.00E-07 2.50E-02 (13)	1.26E-07
			6 + 0 0		0 + 0 0	0 + 0 0				•
100	REV >50NS		9.00E-01	9.00E-01 1.12E+00 (13)	1.006+00	9.00E-01 2.04E+01 (13)	9.006-01 6.306-01 (17)	9.00£-01 6.30£-01 (17)	9.00£-01 6.17£+00 (13)	9.00E-01
•				0 + 0 0	0 + 0 0	9 + 9 6				۰
200	K DAMAGE		1.00E-18	1.006-18	5.00f-12	1.00f-18	1.006-18	1.006-18	1.006-18	5.38E-10
		. !		0 + 0 0	0 + 6 0	9 + 9 6	0 + 0 0	9 + • a		۰.
104	SURGE Z		1.006.18	1.006+18	1.006+09	1.006+18	i.00£+18	1.006+18	1.006+18	2.206+09
			0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0		0 + 0 0	• •
1	SURGE Z		1.12E.00 4.00E-01 (24)	1.126.00	1.736.00	1.126.00	1.126.00	1.126.00	1.126+00	1.10£ +00
	9 9 6	-	0 + 0 0	0 + 0 0	2 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 • 0 0	• •
1	FURNARD		1.396-13	1,396-13	7.266-10	1.391-13	1.396-13	1.396-13	1.396-13	4.20E-14
0	0 0 0		6 0 0 0	0 0 0 0						0 0
	(TRAC FLAG)		IN 753A	IN754A	IN 755A	IN 756 '	IN756A (1)	11758	IN 758A	IN 758A1

DIODE DEVICE LIBRARY (Cont'd)

	+ 0 0 0	2	o	R 01	g		• VD81	0	01	OddI	•	« 8 ×	SURCE Z	OLTRAC REF.
	. 0	SURGE 2	+ 0 0	SURGE Z	* a a	DAMAGE	W K DAMAGE	* o o	DAMAGE	×		×	×	×
		(REF)	- 1	1	1	1			(REF)	(REF)		(REF)	(REF)	(REF)
	o	1.016.00	0	1.006.10	0	3.581-10 .	9.001-01		2.66E-07 .	-	• +0-3	1.00E+01 .	2.10E+01	
	+ 0		+ 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	+ 0			• 0		-	• •	• 0		
	G.		o		a	0		6	•		•	•		
	0 5	.01E+00	0	9.80£+09	o	3.95E-10 °	10-300.6 ·	•	1.80E-07 °	1.00E-04	• +0-3	1.00F+01 ·	2.10E+01	
	+ 0	!	+ 0	1	+ 0		-	+ 0	- 0			-	-	
	ò		6		o	0		6	•		•	•		
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	0 7	036+00	0	8 .90E +09	0	3.69E-10 *	9.00E-01	0	2.49E-07 °	1.00E-04	• +0-	1.006+01	2.10E+01	
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	9 0		9 0		0 0	, 0			. 0		• •	•		
		.0 5 E +00	0	6.50E+09	0	3.37£-10 •	9.00E-01	0	2.38E-07 .	1.00F-04	• +0-3	1.00E+01 •	2.10E+01	
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0000	0		0		0	0	(50)	o	9		۰	•		
3 9 0	0 .	.126+00	0 .	1.006+18		1.006-18	9.00E-01		1.00E-07	1.00E-04	• 50-	6.20F.00	7.90E-01	
	. 0	7.908-01	+ 0	1	+ 0	+ 0	1.801+00	+ 0	+ 0	1.80E+00	• 000+3	+ 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1
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\$ 7.60E-12	0 2	.36E+00	o	1.206+10		1.30E-12 °	8.006-01	4	4.23E-08 °	1.00F-04	• 40-	2.00E+01 .	2.10F+01	
(1)	+ 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	+ 0	1 1 1 1 1	+ 0		1	+ 0	+ 0	1	+ 0		-	1 1 1
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DIODE DEVICE LIBRARY (Cont'd)

	0 0	15	0 +	D.	0 +	RDL	000		0 +	VOBI		0 .		e 0dd1	4.8	0 +	SURGE Z	0 +	OLTRAC REF
0 0 0		R BULK FORWARD (REF.)	0 0 0	SURGE 2 REV 105 (REF)	0 0 0	SURGE Z REY IDUS :	* K DAMAGE * REV <50NS * (REF)	ACE SONS	× × ×	w Z	24	DAMAGE o		K 8 6 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	* (REF.)	, o o a	K (REF)	000	K (REF.)
1	1		1	1	1		1												
0 0 0		5.206-09	0 + 0	1.928+00	0 + 0	8.906.06	1.201-12		0 + 0	8.006-01	0 + 0	4.95E-08	-	. 000 - 04	4.00	4.006+01	2.106+01	0 + 0	
0			0		0			1						9				0	
0.0		1.588-09	n +	1.688 +00	0 +	1.546+09	1.201-12		0 +	9.00E-01	0 +	1.596-08		1,00E-04 °	1.00	E+02 o	4.00E+01	0 +	
0.0			0 0	4.00E+01	0 0		5.056-01		. 0 0	70	0 0	1.916+00 ° (67)	0	9.606-02 0	8 . 50	8.50E-01 = (20)		0 0	
0 0	0 0	8.706-10	0 +	1.616 +00	0 +	1.10E+06	2.40E-12		0 +	9.006-01		1.33E-07 °		1.00E-04 °	7.50	7.508+01 0	8.506+01		
	0 0		0 0		0.0		2.6	17 12	0.0		0.6	0.0		0 0		9 0		0 0	
	0 6	3.516-09	0	2.02E+00	0	4.60E+08	1.146-12		0	1.00E+00	0	3.288-09 =	-	0.001.001	7.50	7.50E+01 °	2.10E+01	0	
5 (2 (3)		1			0 0				+ = 0			• 9 0		0 0		. 0 0		• 0 0	
	0	1.106-08		Z.09E+00	0	5.501.08	1.286-12		0	8.508-01		3.416-09 0	-	1,008-04 :	7.50	7.506+01 *	2.106+01	۰	
0 6 0			. 0 0		* 0 0			1	+ 0 0		+ 0 0	+ 0 0		+ 0 0		+ 9 0		+ 0 0	
	0 0 2 0	1.108-56	0 + 5 0	2.05E+00	0 + 0 0	5.60 6.08	9.605-13	in	0 + 0 0	1.00E+00	0 * 0 0	3.576-09		1.00E-04	7.506	7.50E+01 a	2.10E+01	0 + 0 0	
	0000	1.005-48	0 + 0 0	2.03£ +00	0 + 0 0	4.801.408	1.186-16	7	0 + 0 0	9.506-01	0 + 0 0	3.64E-09	-	1,00f-04	7.50	7.506.01	2.106+01	0 + 0 0	1
	0 0 0 0	1.158-08	0 + 0 0	2.04 € +00	0 . 0 0	5.70E+08	1.238-12		0 + 9 0	9.506-01	0 + 0 0	5.63E-09	-	1.008-04 0	7.50€	7.508.01 .	2.10E+01	0 + 0 0	

DIODE DEVICE LIBRARY (Cont'd)

PAGE 19

	× (2)		1	1			
			. + 0 0	0 + 0 0		0 + 0 0	0 + 0 0
20000	(REF)	2.10E+01	1,036+02	2.10E+01	1.90E+00	2,10E+01	2.106+01
. +		0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 5 0	0 + 0 0
2 1	(REF)	7.506+01	1.20E+01	1.506+01	1.80E+01	3,30E+01	1.50£+01
. +		0 + 0 0	0 + 0 0	0 + 0 9	0 + 0 6	0 + 0 9	0 + 0 0
1 1 1 1 1	X 3	1.00E-04	1.00E-04 1.00E+00 (17)	1,00E-04	1.00E-04	1.00E-04 1.00E+00 (17)	1,00E-04
• +	0 0 0	0 + 0 6	0 + 0 0	0 * 0 0	0 + 0 0	0 + 0 0	0 + 0
0.1	DAMAGE DRWARD (REF)	2.878-09	2.02E-03 (13)	1.006-07	1,00E-07	1.00E-07	2.53E-08
o +	000	0 + 0 0	0 + 0 0	0 4 0 0	0 + 0 0	0 + 0 0	0 + 0
VDB I	REV >50NS	9.506-01	9.00E-01	9.00E-01 7.59E+00 (13)	9.00E-01 7.30E-01 (20)	9.00E-01 4.27E+01 (131	5.008-01
o +		0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0
CDO	R DAMAGE REV <50NS (REF)	1.191-12	3.296-10	1,006-18	1,00E-18	1.006-18	5.66E-12
0 +		0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0
RDL	SURGE Z REV 10US (REF)	6.301.08	1.001.18	1.00f+18	1.006+18	1.00E+18	4.00E+06
6 4	+ 0 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0 0	0 + 0
0 1	SURGE Z REV 1US (REF)	2.06E-00	1.126+00	1.126.00	1.126.00	1.126.00	1.438.00
o		0 * 0 0	0 + 6 0	8 + 9 9	0 * 0 0	0 * 0 0	0 + 0
1.5	R BULK FURNARD (REF)	1.556-08	1.396-13	1,396-13	1 .39E-13	1.396-13	7.306-07
6		0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0 0	0 0 0
DEVICE NAME	(TRAC FLAG)	N91486	IN % 33	189658	185678	149738	1N 09 5

END OF LISTING

(TKAC FLAC)	BULK RESISTANCE				*
	RESISTANCE E-B	VEBI O KEL	t lppc o lppE		SURGE ZC . SURGE ZE
	2 ,	2 SURGE C-B •	2 SURGE F-B •	DAMAGE K (<50NS)	DAMAGE K (>50NS)
		(REF.)	(REF)	REF.)	(REF)
	K FURNAR	×	·		i ×
	(REF) E-B	(REF) E-B	(-B (REF)	(REF)	(REF)
	1.536+02 0 2.646-01 0	0 80-371-1 0 01-375-08 0	• 004E-14 • 1-01E+00	2.95F-12 0 9.00F-01 0	1.005+07 + 2.975-15
(1)	+ 0	+ 0	1.00E-03 °	+ •	
0 0 0	3.70E+00 8.90E+00 •	2.406+02 2.506+03 0	1.05E+02 1.83E+02 0	4.46E-06 1.98E-06	1.99E-02 8.86E-03
6 0 0					
SME526517 .	0	•	٠		
0 (0)	+ 0	+ 0	+ 0	• •	* 3.855+01
	9.70E-01 + 1.57E+00 • (34) - 1.57E+00 • 5.00E-03 + 4.10E-04 •	5.85£+02 (34)	3.85£+02 6.70£+01 0	2.05E-01 1.20E-01 (60)	8.546-02 4.406-02
•	09	•	6		
2N DUMMY 0	1.00E+02 * 1.00E+00 *	1.00E-09 . 1.00E-07 .	1.00E-11 ° 1.00E+00 °	1.00E-11 . 7.50E-01	1.10E+08 . 1.00E-13
0000	1.00E+00 • 5.00E-11 •	7.50E-01 0 1.00E+08 0	1.00E-03 0 1.00E-05 0	6.00E+01 • 5.00E+01	2.10E+01 • 2.10E+01
2N1016 °	9.52E+01 0 5.00E+00 0	2.08F-07 0 1.67E-06 0	8.76E-10 ° 1.11E+00 °	1.50E-09 • 7.00E-01 •	1.00E+07 • 2.73E-10
3	1.02E+00 0 4.00E-10 0	1.00E+00 0 1.00E+07 0	1.00E-03 • 1.00E-05 •	1.00E+02 • 2.50E+01	2.10E+01 • 6.20E+00
	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1				

TRANSISTOR DEVICE LIBRARY (Cont'd)

PAGE 2 RCL 1ES SURGE 2C SURGE 2E	C-B (REF)	** (REF.) * 1.00E+07 * 2.78E-10		2.10E+01	2.10E+01 • 2.10E+01	1.00E+07 • 6.00E-09
CCG • VCB1	DAMAGE K (<50NS) C-8 (REF) K	(REF)	•••	1.85£-09 • 7.00£-01 1.00£+01 • 2.50£+01	9.19f-11	6.00E+01
ICS • MC	SURGE E-	(REF) 6-10 6 1.11E+00 6	•••	1.00E-03 • 1.00E-05 •	1,006-06 • 9,948-01 • 1,006-08 •	6.00E-09 • 9.94E-01 • 1.00E-05 •
TI TI WEBI	Z SURGE C-B 1US (REF)	(REF) E-B • •	1.00E+00 • 1.00E+07 •	3.29f-07	5.31E-07	1.99E-05 • 1.59E-04 • 5.00E-04 • 5.00E-01 • 1.00E+07 • • • • • • • • • • • • • • • • • • •
HFEN O HFEI	(REF)	C-6		9.72E-01 b 3.91E-10 b	9.946-01 0 1.416-10 0	1.00E+01 • 5.00E+00 • 9.94E-01 • 1.41E-09 •
DEVICE NAME 9	0 6 6 6	2N 10 16 R	3	2 N 10 16 E	2N1037 (1)	2N1039 (1)

TRANSISTOR DEVICE LIBRARY (Cont'd)

2000 271620		HF EN	o •	HFEI	• •		i	• •	51	0 +	J.	0 +	000	0 +	VC 8 1	BCL.	_		16.5
(TRAC FLAS)	0 0	æ	0 +	CEO	0 +	VEBI o		REL	1990	0 +	IPPE	0 +	C-880V	w +	E-880V	SURGE Z	37	0 \$0	SURGE ZE
	0 0	BULK RESISTANCE	E \$ 1.5	TANCE		Z SURGE 1US	U	-6 -100	105	SURGE E	E-8	0 0	DAMAGE K	1(5)	K (<50NS)	DAM	DAMAGE X	() 2	K (>50NS)
	0 (,	(REF.)		0 .	(REF.)				(REF)			(8	(REF)			~	(REF)	
		1 2	FORWARD	RD	• 6	×				×		+ 0		×				×	
	0 6) 	(86F)	E - 2	0 0	(REF)	1	80 1	9-7	REF)	8 - 1	0 0 1	×	(REF)			~	(REF)	
ZN 1042 RA	0		6		0	0		o		0		0		0					
(0)	0 0		• 0	!	• 0	+ 0	1		1 1 1 1	• •			1	+ 0		9.756+	9.756+01		1.426+02
	0 0 0 0 0	1.60E-01	+ 34	2.95E-01	+ 0 0 + 0 0	5.928.02	34) 2.6	2.63£.02	2.55£+02	34)	5.006.02	• • • • • •	3.111-04	, (09)	2.696-04		1.396.00	. 09	1.201.00
2N1099		1.90E+00	0 + 0 +	2.20E+00 1.50E-09	0 + 0 + 0	6.528-07 0	1.0	1.036-06	2.23E-14	0 + 0 +	1.30E+00	m oc	1.20E-09	0 + 0 +	6.00E-01	1.00E+07	E+07	0 + 0 +	6.60E-14
		1	1		0 + 0 0	1	1	0 + 0 0	1 6 1 1	1	1			1			1		1
(0)		1.422.00	0 + 0 +	4.066-11	0 + 0 + 0 0 + 0 0	7.96E-09 °	1.0	3.186	4.00E-12		1.39E+00 1.00E-05	v v	5.92E-11	0 + 0 + 1	2 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1.00£+07 2.10£+01	F+01	m 4	3.96E-12 4.30E+00
241184	000000	3.236-01	0 + 0 +	7.47E+00 2.60E-10	0 + 0 + 0 0 +	7.691-08 0	1.5	1.50E-07	1.13E-05		1,00F-05	N 4	2.406-10	4.0	4.00 E + 01 E +	1.40E+07	E+07	0 + 0 +	2.00 £ + 0.2

TRANSISTOR DEVICE LIBRARY (Cont'd)

	# # # # # # # # # # # # # # # # # # #	RESISTANCE (REF) FORMARD (REF)	2 SURGE 10S (REF)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Z SURGE E-B 1US (REF) C-B (REF)	FE-B FIDOUS	(K (SURGE ZC SUCAMAGE K (2)	SURGE ZE
281184 1	6.80E+01 6.23E-01 2.00E-01 (32)	7.47E+00 • 2.00E-10 • 3.00E-01 •	7.69E-08 ° 4.00E-01 ° 4 (32)	1.506-07	1.136-05 0	2.00 E+02	2.40E-10 • 4.50E-01 •	2.00 2.00 1.00 1.00 1.00 1.00 1.00 1.00	1.00 E + 0.7 • 2.00 E + 0.2 • • • • • • • • • • • • • • • • • • •	8 .12E-06
2N1225 (1)	0 0 0 0 0 0 0 0 0	3.50E-01 3.30E-12	9	1.126-07	5.40E-07 • 1.00E-03 •	1.11 € +00 • • • • • • • • • • • • • • • • • •	4.006.01	5.00 5.00 1.00	2.10 6.07	1.23E-07 2.10E+01
2W1289 (1)	2	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.596-08	1,006-09	9 9 9 4 E - 0 1 1 1 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	6.00E+011 •	5.00E-01	1.00E+07 • 2.10E+01 •	6.00E-09
ZN1301	9.946-01	5.00£+00 1.41£-11	4.55 £ - 09 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	1.596-08	1.00 E 1.	9.946-01	6.006.01	5.00E-01	2.106.01	1.02E-10 2.10E+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

Column C					1					PAGE 5
C				-	165		000	VCB1	. שכר	2
Control Cont		• •	VE81	REL	. J4dI	IPPE .	C-880V	E-880V	SURGE ZC .	SURGE ZE
1.00f+02 5.00f+00 1.34-08 7.96f-08 3.50f-07 1.49f+00 2.53f-11 1.40f+00 1.00f+07 1.00f+07 1.51f+00 5.92f-12 1.40f+00 1.00f+07		K RESIST	Z SURGE C		Z SURGE	E-8		(<\$0NS)		(>50NS)
Collect State Collect Collec		(REF.)			IUS					
Control S. DOCTOR L. SOCTOR L. SOC	6 0	K FORWARD	×	. •	*		-			:
1.00E-02	9 0	(REF)		F-8		e • •	(RE	••	(RE	=
1.51E+00			0 + 0 +	9 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	• • • •	1.496.00	2.53f-11 • 2.50f+01 •	1.40E+00	1.00 E + 0.7 •	2.106.01
1.50E+02 * 5.00E+00 * 1.33E-08 * 7.96E-08 * 3.50E-07 * 1.49E+00 * 2.53E-11 * 1.40E+00 * 1.00E+07 * 1.51E+00 * 5.92E-12 * 1.40E+00 * 1.00E+07 * 1.00E-03 * 1.00E-05 * 3.00E+01 * 2.50E+01 * 2.10E+01 * 2.50E+01 *		· · · ·		. 96E - 08	3.50E-07 • 1.00E-03 •	1.496.00	2.506.01	1.40E+00 2.50E+01	2.106.01	3,436-07
1.50E+02 * 5.00E+00 * 7.96E-09 * 7.96E-08 * 3.50E-07 * 1.49E+00 * 2.53E-11 * 1.40E+00 * 1.00E+07 * 1.51E+00 * 8.45E-12 * 1.40E+00 * 1.00E+07 * 1.00E-03 * 1.00E-05 * 2.50E+01 *		* * * *	• • • •		3.50E-07 • 1.00E-03 •	1.496.00	3.00 € 01	2.506-01	2.10€+01	2.106+01
		0 + 0 +	• • • •	90-19-1	3.50E-07 • 1.00E-03 •	1.006-05	2.53E-11 • 2.50E+01 •	1.40f+00	1.00 £ +07 •	3.43E-07

TRANSISTOR DEVICE LIBRARY (Cont'd)

		1.56£-09 ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °			(AEF)	(DAMAGE K (>50NS) C-B (REF) R	550NS1 F-B
~	9.92E-61 0 3.70E-11	.	3.33E-07	1.68f-13 •	1.05F + 00	1.506-11	S.00F-01	1.00 £ +07 •	2.05E-14 2.10E-01
2414016 (1)	1.00E+02 0 5.00E+01	1.99ft-05 • 5.00ft-01 • • • • • • • • • • • • • • • • • • •	1.596-04	1.006-09	1.00 E-01	6.00E-03	2.00 £-01	2.10 E+07 •	2.855.02
	9.94E-01 0 5.00E-00	5.006-01	1.08 -04	6.98E-15 °	9.94E-01	6.005+01	S.00E-01	1.00 £ 0.0 7 • 2.10 £ 0.1 •	2.10€+01
, <u></u>	7.96E+01 ° 3.69E+00 1.05E+00 ° 2.30E-10 5.75E-01 4.05E-01 (62)	5.92E-08 • 9.00E-01 • 6.90E+01 •	3.70E-07 1.00E+07 6.90E+01	4.57E-12 • 1.00E-03 • 5.00E-01	9.68E-01 1.00E-05 3.30E-01	7.80E-10 6.00E-10 2.48E-04	2.05E-03	1.00 6 + 07 + 1.75 6 + 00 + 1.11 6 + 00 + 00 + 00 + 00 + 00 + 00 + 00	1.62E-11

PAGE 7

ZNI486 ZNI486 ZNI486 ZNI486 ZNI486 ZNI486 ZNI486 ZNI486 ZNI489 ZNI499 ZNI506 ZNI506	105 Su	1PPC o 1PPE		C • SU
2.00				
10 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0		Z SURGE E-B 10US 0	DAMAGE K (<50NS) C-B (REF)	DAMAGE K (>50NS) C-8 (REF)
11	8 (REF) E-8	K E-B	(X X X)	X X
3.00	E-10	4.57E-12 • 9.68E-01 • 1.00E-03 • 1.00E-05 • • • • • • • • • • • • • • • • • • •	1.00E+02 1.00E+02 1.00E+01	1.00f+07 * 1.62f-11 2.10f+01 * 2.10f+01
1.37E+00 1.37E+00 2.86E+01	E-02 0 2.15E.00 1.60E.01 0	1.65 E+00 1.65 E+00 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4 . 74 £ - 04	2.12E+00 (60) 3.80E+00
2.86E+01 *	FE-12 0 5.00E-0.06 0 1.59E-0.06 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.00E-06	4.24E-12 • 5.00E-01 • 2.00E+00 • •	1.00£+07 • 1.00£-06 2.10£+01 • 2.10£+01
1011	E-10 • 9.12E-10 • 3.34E-07 • E-10 • 9.00E-01 • 1.00E-07 • • • • • • • • • • • • • • • • • • •	1.17E-13 • 1.01E+00 • 1.00E-05 • 1.00E-03 • 1.00E-05 • • • • • • • • • • • • • • • • • • •	6.00E-11 • 8.00E-01 • 6.00E-01 •	2.10E+07 • 3.82E-14

TRANSISTOR DEVICE LIBRARY (Cont'd)

	ME CEGO CEGO CEGO CEGO CEGO CEGO CEGO CEG	Z SURGE C-B 10US (REF)	1PPC 0 1PPE 0 1 SURGE E-B 10US 0 (REF)	C-88DV • E-88DV • C-88DV • C-88DV • C-88DV • C-88DV • C-88DV • C-80NS) • C-80NS • C-	SURCE ZC • SURCE ZE DANAGE K (>SONS) C-B (REF)
	C - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 -	(E E E E E E E E E E E E E E E E E E E	K F-B (REF)	(REF.)	(K K K K K K K K K K K K K K K K K K K
2N15.8 (11)	2.86E+01 • 3.00E-01 • 1.55E-10 • • • • • • • • • • • • • • • • • • •	8.12E-10	1.17E-13 • 1.01E+00 • 1.00E-05 •	4.60E-11 • 8.00E-01 • 6.00E-01 • 6.00E-01 • 3.00E-01 • 6.00E-01 •	1.00E+07 • 3.62E-14 2.10E+01 • 2.10E+01
2N1613	8.00E+01	1.77E-08 • 7.96E-09 • 7.13E-01 • 1.00E+07 • 6.05E+01 • 6.05E+01 • 7.70E-01 •	4.00E-11 • 1.19E+00 • 1.00E-03 • 1.00E-03 • 1.00E-05 • 7.55E+00 • 7.55E+00 • 1.00E+00 •	2.59£-1] • 1.68£•00 • 7.50£+01 • 7.00£+00 • 3.40£-04 • 6.30£-05 •	1.00 E+07 + 3.88 E-11 6.05 E+01 + 7.55 E+00 1.52 E+00 2.82 E-01 (60)
2N1709	2.50E+01 e 2.50E-01 e 1.05E+00 e 4.20E-10 e	1.54E-09 ° 1.10E-06 ° 1.00E+00 ° 1.00E+07 °	3.15E-12 • 1.11E+00 • 1.00E-03 • 1.00E-05 •	1.02f-10	1.00E+07 • 2.08E-13 2.10E+01 • 2.10E+01
1171NS	2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 - 2 -	2.27E-09 • 7.96E-09 • 5.00E-01 • 1.00E+07 •	1.006-08 • 2.496+00 • 1.006-03 • 1.006-05 •	3.54E-11 • 5.00E-01 • 7.50E+00 • • 7.50E+01 • 7.00E+00 • • • • • • • • • • • • • • • • • •	2.10E+07 • 5.00E-09

x x x		-				211			222		1934	111		2
8 OF	- 4	CEO	• VEB1		REL .	1990	IPPE		C-880V		E-880V .	SURGE 1C	. su	SURGE ZE
	1 ×	RESISTANCE	0 Z	Z SURGE C-B		Z SUR	Z SURGE E-B	• •	E .	K (<50NS)	ONS		K (>50NS)	ONSI
-		D	sol .	(REF.)		103	IBUS (REF)		9-	(REF)	9-1	=	(REF)	1
	K FORMARD	8 D		×		-		••		=		-		
6-9		8 - 3	8-0	(REF.)	F - 8	8-)	(REF) E-B	••	=	(REF)	••	-	(REF)	
8 . 00 £ + 0.1		2.30E+00	9 8	• • • •	1.376-07	3.60E-12	1.11		1.006 +01	• • • •	0 0 0	2.106+07		3.20E-13
3.306+01		5.50E-09	1.00		1.006+04	1.006-03	1.146.00	• • • • • • • • •	1.756-09		1.00E+00	2.106.01		6.18 E-10
1.216.00		1.006-09	1.59E-06	• • • •	1.596-05	1.000.1	1.19f +00		1.10E-09		1.00 E+00	2.106.00	• • • • •	2.10E+01
3.706+01		3.206-11	8.001		4.14E-07	3.03E-13	9.686-01		7.80E-13	• • • •	7.00E-01	1.00E+07		1.006+01

DEVICE NAME OF	0 · 0 ·	1 N	ICS ON THE OF TH		SURGE ZC SURGE ZE
0 0 0	RESISTANCE E-B (REF)		Z SURGE E-B 1US 10US 0	DAMAGE K (<50NS) • C-B (REF)	DAMAGE K (>50NS) C-B (REF)
0 0 0 0	KERNARD C-8 (KEF)	(-B (REF)	(-B (REF)	(# FF.)	(REF.)
000000000000000000000000000000000000000	1.03 ± 1.00 ± 1.	8.00f-01 1.008f-06 1.008f-06 1.008f-06	2.32E-11 % 1.02E+00 %	1.80E-09 · 7.00E-01 · 1.40E-02 · 5.00E-00	1.00 F+07 * 1.60 F-11 2.10 F+01 * 2.10 F+01
2N2048 (1)	2.50E+01	6.12E-10	4.00E-09 0 9.94E-01 0 1.00E-03 0 1.00E-05 0	2.12E-12	1.00 E+07 • 4.00 E-09 2.10 E+01 • 2.10 E+01
242060	1	8.001-10 6.171-07 9	1.20E-13 * 1.08E+00 * 1.00E-05 *	3.48f-11 • 9.00f-01 · 1.00f · 02 · 7.00f · 00	1.00 E+07 • 2.60 E-13 2.10 E+01 • 2.10 E+01
242567	00 16 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.06E-09 5.000-01 1.00E-09 1.00E-09	1.62E-12 • 9.94E-01 • 1.00E-05 •	1.70E-11 • 5.00E-01 • 1.20E+00	1.00 E+07 • 4.86 E-14 2.10 E+01 • 2.10 E+01

TRANSTEROR SVICE LIBRARY (Cont'd)

(TRAC FLAG) *	WE CEU	VEBI **	1996	C-880V • E-880V	SURGE ZC . SURGE ZE
	SULK RESISTANCE C-5 (REF)	SURGE C-6 10US (REF)	Z SURGE E- 1US (REF)	DAMAGE K (<50 C-B (REF)	DAMAGE K (>50NS) (-B (REF)
0 0 0 1	N	(3)			(ke x
242102	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.84E-10	1.16£-12 • 1.04£+00 • 1.00£-05 • • • • • • • • • • • • • • • • • • •	1.03£+00 • 8.00£-01 • 1.20£+02 • 7.00£+00 • •	1.00E+07 a 2.85E-13 2.10E+01 a 2.10E+01
242187	3.30£.01 • 6.10£-01 9.95£-01 • 5.40£-12	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	5.67E-13 1.00E-03 1.00E-03 1.00E-05	3.00 £ +01 3.00 £ +01 3.00 £ +01	1.00E+07 * 5.67E-14 2.10E+01 * 2.10E+01
2N2185 (0)	0100	2.00 FF-09 3.18 FF-08 1.00 FF-08	1.00f-05 1.00f-05 1.00f-03 1.00f-03 1.00f-05 1.00f-05	2.22 6F-12 6 6.00 6.00 6.00 6.00 6.00 6.00 6.00 6	1.00 E + 0.7 * 1.00 E - 0.5 2.10 E + 0.1 2.1
202192	0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9.00 E - 0.05 E - 0.07 E - 0.0	9 . 4 9 E - 13	6 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 . 0 .	1.00 E + 07 * 1.31 E - 13

TRANSISTOR DEVICE LIBRARY (Cont'd)

OFVICE NAME OF	2 · 0 · 0	FEI	TN VEBI	0 + 0 +	100 PPC + 0	#C + 0 + 1 1 1 1 1 1 1 1 1 1		VCB1	SURGE ZC •	SURGE ZE
	6ULK RESISTANCE C-B (REF)	 	2 SURGE C-8 1US (REF)	C-8 10US	2 SURGE E-B 105 (REF)	1005 °	DAMAGE K (C-8	K (CSONS) • E-8 •	DAMAGE K (>SONS) C-8 (REF)	>50NS1 E-8
0 0 3 1		0 a 6	C-8 (REF.)	B - B	C-8 (REF)	88	(REF)	. · · ·	K (REF)	
2N2219 (1)	1.500.1	1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4.8446-10	11 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4. ** ** ** ** ** ** ** ** ** ** ** ** **	1	6 .00 6	2	3.00 E+07 • 2.10 E+01 • •	5.66E-14
2422194	6 1 9 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.326.00	9	2 - 74 E - 0 7 1 - 0 0 5 E - 0 7 6 E	3.706-14 9	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6.00111	000000000000000000000000000000000000000	1.00E+07 •	9.306-15
28.22.22	9 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9.00 6-12	3.748-07 1.006+07	3.706-14	1.0016-00	6.008+011	9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	1.00E+07 • 2.10E+01 •	9.30E-15
2N2223	7 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 + 6 + 1 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6.177E-07	1.78 FF - 1.2 1.00 FF - 1.2 1.00 FF - 1.3 4.0	1.008 F+	3 100 1	7.006-01	1.00 E+07	1,08E-13

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME	HEEN HEEL	V	TI KEL		MC	CCG .	VC81	SURGE ZC + S	IES SURGE ZE
	BULK RESISTA	2 5 1105	E C-B	-	-8 10US	DAMAGE K (K (<50NS) •	DAMAGE K ()	K (>50NS)
		(KE F)	• •	(REF)	•	(REF)	• •	(REF)	,
	C-5 (AEF) E-8	C-8 **	E-8	K (-8 (REF)	8 - 9	x 33		* (REF.)	
282243	9.77.6.00	0 + 0 + 0 0 + 0 0	2.65E-07 1.00E+07	7.53E-14 • 9.77 1.00E-03 • 1.00	1.006-05	3.006-11	7.00 E+001	1.00E+07 • 2.10E+01 •	2.10 € 401
2N 22 70	1.006+00 1.006+00 9.946-01 4.06+00 4.066+00 1.006+00	5.006-01	1.596-06	6.98E-15 • 9.9	1.00 E-05	6.001+01	5.00E-01.	1.00 £ + 07 • 2.10 £ + 01 •	6.98E-15
242368	4.25£+01 • 1.00£+00 • 9.77£-01 • 4.90£-12	2 - 9 3 6 - 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.006+07	4.00E-12 • 1.2 1.00E-03 • 1.00	2.20f+00 .00f-05	8.20E-12 •	1.00E+00 +	1.00 £+07 •	2.11E-15
2N2369 (0)	1.046.00 0 2.586-12	3.18F-10 • 1.06F+00 • •	3.18E-09	2.26f-10 • 1.65 1.00f-03 • 1.00	1.65E+00 •	2.63E-12 •	4.50E+00	1.00£+07 •	4.99E-15

TRANSISTOR DEVICE LIBRARY (Cont'd)

	DEVICE NAME .	N34H	HFE1	TN o	0 11	10.5	. O#	000	v VCB1	RCL . IES	1ES
C		ME		SURGE	REL C-6	IPPC •	1PPE • • • • • • • • • • • • • • • • • •		E-880V	* • • •	E 16
1 2 2 2 2 2 2 2 2 2	0 0	6-8				1US (REF.)	1005	C-8	F) E-8	C-B (REF)	•
1) 9 9 2 2 2 4 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0 1 0		C-B (REF)	+ 0 0 6		į.	ı	1 4	38		(REF.)	
1)		2		1	1.00 E + 0 + 0 0	1.75E-15 • 1.00E-03 •	9.6 - 0.1 - 0.0 E - 0.	1	1		DE+01
11 9,44E-01 0 1,50E+00 0 3,47E-10 0 2,40E-07 0 6,00E-13 0 1,00E+00 0 6,90E-12 0 8,00E-01 0 1,00E+07	2	0 . 0 .		1	3.36 E - 0.09	1	1.00 E-00 S E-00	4.006-12	8 .00f-01	• • • •	SE-15
9.52E+01 = 1.60E+00 = 3.96E-10 = 3.30E-07 = 3.00E-14 = 1.02E+00 = 5.80E-12 = 8.00E-01 = 1.00E+07 = 1.00E+07 = 1.00E-05 = 2.50E+01 = 2.10E+07 = 2.10E+07 = 2.10E+07 = 2.10E+07 = 2.10E+01 =	2	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 + 0 + 0 + 0		2 - 4 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6 - 6	1	100000000000000000000000000000000000000	1		• • • •	DE+01
	2	9 -52 ZE - 01 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -			3		1.02E+00			• • • •	SE-15

SURGE ZE		1,32E-14	2.106.16	7.94£-15 2.10€-01	3.33E-14
0 + 0 + ×	(REF1	0 + 0 +			* * * *
SURGE ZC		1.00£+07 2.10£+01	1.00£+07 2.10£+01	1.00£+07 2.10E+01	1.00E+07
0 * * * 0 0	0 + 0 0 0	0 + 0 + 0 0 + 6 0		0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 +
* F-880V K K SONS 3		9.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00	9.00E-01	4.00 E + 000	8.00E-01
			0+0+	0 + 0 +	
CCB BDV C-B BDV C-B		1,90E-11 2,50E+01	3.506.01	1.506+01	6.006+01
0 + 0 + 0 0	0 + 9 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 +
SURGE E-8	as	1.02E+00	1.14E+00 1.00E-05	1.65E+00 1.00E-05	1.006-05
0 + 0 + 0	E * E	0 + 0 +	0 + 0 +	0 + 0 +	6 + 0 +
105 1PPC 1US 2	8	3.606-14	1.318-14	3.64E-10 1.00E-03	1.786-13
9 + 9 + 9 9	0 + 0 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 * 0 0		0 + 0 + 0 0 +
REL C-8 10005		1.006+07	1.00 E E E E E E E E E E E E E E E E E E	1.006.08	4.82E-09
SURGE	# x x = 1	0 + 0 +	* * * *	0 + 0 +	0 + 0 +
VERI L		9.05E-10 8.00E-01	9.606-01	1.59 E-10	3.86 1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.0
0 + 0 + 0 0	0 + 6 6 0	0 * 0 * 0 0 + 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 + 0 0	0 + 0 + 0 0 +
8 5 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1		4 . 5 . 0 0 E . 0 0 E . 0 0 E . 1 1 0 0 0 E . 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.20 F - 12	1.706-61	7.806-01
8 * 0 * 8	FUREED (REE)	0 + 0 +	0 + 0 +	0 + 0 +	
HFCN SULK C-8	× 8	6.15E+01 9.92E-01	5.00E.01 9.92E-01	1.10 € .06	9.528+01
		5 0 0 0 0 0 0 0 c	0 0 0 0 0 0 0 0	000000000	
DEVICE NAME		5856.95	242.708	2N2784	27.2361

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME .	HFEN O HFEI	VEB1 0 + 0 + 0	1CS • HC • IPPE •	CCG • VCB1 • C-880V •	SURGE ZC . SURGE ZE
0 0 0 0	BULK RESISTANCE C-B (REF)	Z SURGE C-B 10US 0	Z SURGE E-B 10US (REF)	DAMAGE K (< SONS) C-8 (REF)	DAMAGE X (>50NS) C-B (REF)
9 6 6 6	(REF.)	(REF)	() () () () () () () () () ()	x x x x x x x x x x x x x x x x x x x	(
2 × 2 € 0 9 €	2.28E+01 + 1.30E+00 + 9.44E-01 + 9.00E-13 +	1.346-10 0 2.496-08 0	9.02E-15 • 1.11E+00 • 1.00E-03 • 1.00E-05 •	1.30E-12 • 1.00E+00 • 6.00E+01 • 5.00E+01 •	1.00E+07 • 4.17E-17 2.10E+01 • 2.10E+01
2.42.845	5.00E+01 9.92E-01 9.92E-01 9.92E-01	5.88E-10 0 1.56E-08 0 9.00E-01 0 1.00E+07 0	2.45E-11 • 1.33E+00 • 1.00E-03 • 1.00E-05 • • • • • • • • • • • • • • • • • • •	9 .00E-12 . 9 .00E-01 . 6 .00E-01	1.00E+07 ° 2.35E-14 2.10E+01 ° 2.10E+01
2426576	2.15£+00 • 2.44£+00 • 1.01£+00 • 1.36£-10 •	1.21E-09 • 1.24E-07 • 8.00E-01 • 1.00E+07 •	1.11E-13 • 1.02E+00 • 1.00E-05 •	6.88f-11 • 8.00f-01 • 3.00f-01 • • 3.00f-01 • • 6.00f-01 • 6.00f-00 • • 6.00f-01 • 6.00f	1.00E+07 • 8.00E-15 6.50E+01 • 1.60E+01
2N2657NET (1)	6.46E.01 • 5.30E-01 • 5.30E-01 • 2.40E-00 • 1.00E-12 • 2.40E-00 • 2.30E-05 • 2.90E-05 •	2.64E-10 • 3.60E-12 • 2.00E+00 • 1.00E+07 • 6.70E+02 5.70E+02 •	5.03E-15 • 1.08E+00 • 1.00E-05 • 1.00E-05 • 1.65E+01 • 5.50E+01 • 6.50E+01 •	1.22E-12 • 2.00E+00 • 3.00E+01 • 2.50E+00 • 5.24E-06 • 5.38E-07 • 601	1.00E+07 • 2.05E-15 6.50E+01 • 1.65E+01 2.34E-02 2.41E-03

ZNZS87 4.83E+01 9.20E+00 ZNZS87 4.83E+01 9.20E+01 ZNZS87 4.83E+01 9.20E+01 ZNZS94 7.00E+01 9.20E+00 ZNZ905 1.33E+02 9.44E+12 ZNZ905 1.33E+02 9.40E+11 ZNZ907 9.60E+01 9.180E+11	+ VERI O **			
11		IPPC o IPPE	C-880v o f-880v o	SURGE ZC . SURGE ZE
11	ο 2 SURGE (-Β ο 100 ο 100 δ ο	SURGE E	DAMAGE K (<50NS) .	DAMAGE K (>50NS)
1)		(REF)	(REF)	(REF)
1) 1.04E+01 • 1.04E+01	x x 3	×	• •	· ×
11	(REF)	(REF)	(REF)	(REF)
7.000£+01 • 1.95£+00 •	2.846-10	• •	1.03E-10 • 8.00E-01 •	1.00£+07 • 2.85E-13
7.00£ +01 • 1.50£ -02 • 1.95£ +00 • 2.30£ -02 • 1.33£ +02 • 1.35£ +02 • 1.36£ +02 • 1.36£ +02 • 1.36£ +02 • 1.36£ +02 • 1.36£ +02 • 1.36£ +01 •	9.00E-01 • 1.00E+07 •	1.006-03 • 1.006-05 •	1.006+02 • 4.006+04.	2.10E+01 • 2.10E+01
7.00f+01 • 1.50f-02 • 1.95f-00 • 1.95f-00 • 1.95f-00 • 1.95f-02 • 1.95f-00 • 1.95f-02 • 1.95f-01 •	+ 0 0			
2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	2 0 1.08 F+00 0 1.00 F+02 0 0 0 4.60 F+00 0 1.00 F+02 0 0 0 4.60 F+02 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.11E-12 • 1.49E+00 • 1.00E-03 • 1.00E-05 • 1.30E+01 • 1.30E+01 • (34)	3.89f-12 • 1.01f+00 • 1.20f+01 • 4.00f+00 • 7.78f-06 3.82f-06 •	3.48E-02 1.71E-02
2 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	0 0 4.78£-08 0 4.64£-08 0 1 0 1.60€+00 0 1.00€+07 0	4.42E-14 • 1.01E+00 • 1.00E-03 • 1.00E-05 •	1.45E-11 • 8.00E-01 • 6.00E+01 • 5.00E+00 •	1.00E+07 • 9.82E-15
2 - 10E + 02	+ 0 0			!
a	1 • 1.00E+00 • 1.00E+07 •	1.48E-13 • 1.43E+00 • 1.00E-03 • 1.00E-05 •	6.00E-01 • 1.00E+00 • 6.00E+01 • 5.00E+00 •	1.00E+07 • 2.21E-14 2.10E+01 • 5.00E+00
1				

TRANSISTOR DEVICE LIBRARY (Cont'd)

(TRAC FLAG) .	+ 0	+ 0	v E B I	REL	• Jdd1 •	IPPE	C-880V	E-880v	SURGE ZC . SU	SURGE ZE
	BULK RESISTANCE C-6 (REF)	+ 0 0 0	2 SURGE C-B 105 (REF)	1 0	2 SURGE E-B 105 100S	F-8 10US	DAMAGE K C-B	K (<50NS) • E-B • (REF)	DAMAGE K (>50NS) C-8 F-B	E-8
	C - S X X X X X X X X X X X X X X X X X X	+000	C-8 (REF.)	89	(REF)	f - B	3	K K K	x 3	
- C - C - C - C - C - C - C - C - C - C	1.00f.01 9.994E-10 1.41E-10	0 + 0 + 0 + 0	3.70£-07 0	1.596-06	1.006-09	1.006-05	6.001-10.0	5.00E-01	1.00E+07 • 5	5.00E-09
2N2596	2.56.6.01 9.00.000000000000000000000000000000000	0 + 0 + 0 0 + 0	6.76E-10 • 9.00E-01 •	1.005.1	1.754-15	10011	5.30E-12	3.006	1.00£+07 • 6 2.10£+01 • 2	2.106.401
2N3013 (1)	9.92E-01 • 2.50E-01 1.45E-03 • 1.65E-00 (34) • 4.40E-05 5.80E-05 • 4.40E-05	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.97f-10 • 9.00f-01 • 3.85f-02	7.501.02	1.60E-12 • 1.00E-03 • 9.50E+00 • 1.00E	1.25£ +00 1.00£ -05 9.50£ +00	3.48E-12 • 4.00E+01 • 3.82E-06	9.00E-01 • 5.00E-01 • 5.00E-06 • 5.80E-06	1.00E+07 • 4 1.51E+01 • 9 1.71E-02 2 (60)	4.27E-15 9.50E+00 2.59E-02
243017	1.026.00 . 4.806-10	0 0 0	1.28E-09 • 9.00E-01 •	8.97E-06	8.64E-13 •	9.92E-01	1.70E-10 •	4 .00E-01	1,00£+07 • 8 2,10£+01 • 2	8.00E-13

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME S			VEB1	RFL 1	105 · • • • • • • • • • • • • • • • • • •	3 d d J		VC81	SURGE ZC +	IES SURGE ZE
00000	(REF)		Z SURGE 1US (REF)	U	Z SURGE 1US (REF)	1005	0 P R C C C B C C C C C C C C C C C C C C C	(REF)	DAMAGE K (>) (C-B (REF)	K (>50NS) E-B REF)
	2 (0 6	(KRF)	D	(REF)	9 6 1	(REF.)	0 0	(REF)	
30 23 3	0 10 10 10 10 10 10 10 10 10 10 10 10 10	0 + 0 + 0 0 + 0 0	5 . 0 2 7 E - 0 3 7	0 + 0 + 0 0 + 0 0	6.98 FF - 15 F	6 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2.47E-10 • 6.00E+01 • •	000000000000000000000000000000000000000	1.00 E+67 • 2.10 E+01 •	6.98E-15
243655	0 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 • 0 • 0 0 • 0 0	9 + 0 + 1	2 1 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0.00 - 0.0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.406-11	17.000000000000000000000000000000000000	1.00E+07	5.35E-14 2.10E+01
2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	3.038+01 • 4.5598+00 3.928-01 • 2.208-11	0 + 0 + 0 0 + 0 6	9 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	8	1.006-12	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.40E-11	7.006-01	1.00£+07 •	8.18E-14 2.10E-01
24315	9.9969999999999999999999999999999999999	0 - 0 - 0 - 0	0 + 0 + 1	0 · 0 · 0 · 0 · 0	0 • 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9446	1.98E-111 • 2.00E+011 • •	2	1.00 E + 07 •	4.00E-09

(TFAC FLAG)			w w 1	CLB	105 *** 1 PPC *** 2 SURGE F-B 10US (REF)	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	C-BBOV C-BBOV C-B CREF	E - 88 D V S D N S J E - 8 B D V S D N S J E - 8 B D V S D V	SURGE ZC *	* SURGE ZE * SURGE ZE * (>50NS] E-B
	2	30 e e i	X (-8)	9	(-8 (REF)	a	(REF.)		(REF)	
233244	0.0.	25.10	4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4	1.0011.008	1.02f-13 •	9 4 9 4 9 4 9 4 9 4 9 4 9 4 9 4 9 4 9 4	4,306-11	8	1.00E+07 *	2.10E+01
283251		0 + 0 + 0 0 + 0 0	2.59 9	8 + 6 + 9 0 + 6 0 9 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.1966-03	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6.50E-12 •	6	1.00 E+07 •	4.02E-15
(1)	0 + 0 + 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	8 10 10 10 10 10 10 10 10 10 10 10 10 10	4, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9, 9,	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.644	1.05 F	6.00 6.00	8	1.00E+07	5.16E-14
24326A (1)	100.194.1	1.4.11.00 1.4.11.00 0.00	1,99E-05 • 5.00E-01 • •	1.59E-04	6.00E-09 • 1.00E-03 •	1.006-05	2.12E-10 • 5.00E+01 •	2.00f-01	1.00E+07	1.60E+01

	DEVICE NAME .	HFEN & HFEI	. II	•	• 183A • 033	
				• •	• • •	••
1.254-01 2.666-01 2.686-10 2.276-08 2.006-03 1.006-10 1.006-12 3.006-01 1.006-07 1.006-03 1.006-03 1.006-12 3.006-01 1.006-07 1.006-03 1.006-03 1.006-03 2.006-01 1.006-07 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-03 1.006-04 2.106-04 1.006-04 1.006-04 1.006-04 1.006-04 1.006-05		K RESIST	SURGE C	SURGE E	× (<5	K (>5
1.25f+01	6 0	(REF.)	(REF)	(REF)	REF)	(REF)
1.254-01	6 6	K FORWARD	×	· ×	* * * * * * * * * * * * * * * * * * *	· ·
11	0	(866)	(REF.)	(REF)	(REF)	(REF.)
2.406+01 a 6.206-12 a 5.006-01 a 1.006+07 a 1.006-03 a 1.006-05 a 5.506+01 a 5.006-01 a 2.106+01 a 5.006+01 a 1.006+07 a		8				
2.40E+01 = 1.38E+00 = 6.63E+10 = 9.93E+07 = 5.35E+14 = 1.14E+00 = 1.80E+12 = 1.00E+00 = 1.00E+07 = 9.68E+01 = 1.90E+01 = 3.00E+01 = 3.00E+00 = 2.10E+01 = 9.68E+01 = 1.90E+01 = 3.00E+00 = 2.10E+01 = 9.68E+01 = 2.80E+01 = 3.00E+01 = 3.00E+01 = 3.00E+01 = 2.10E+01 = 9.98E+01 = 2.80E+01 = 1.00E+07 = 1.00E+07 = 1.00E+07 = 1.00E+07 = 3.30E+01 = 2.10E+01 = 2.10E+01 = 2.10E+01 = 3.30E+01 = 3.30E+01 = 3.30E+01 = 3.00E+01 = 2.10E+01 = 3.30E+01 = 3.00E+01 = 2.10E+01 = 3.30E+01 = 3.30E+01 = 3.30E+01 = 3.00E+01 = 3.00E+01 = 3.00E+01 = 3.00E+01 = 3.30E+01 =		+ 0	٠.	٠.	٠.	٠.
2.40E+01 = 1.3EF+00	6 6 6	•	•			•
2.40E+01 = 1.38E+00 = 6.03E+10 = 9.93E+07 = 5.35E+14 = 1.14E+00 = 1.80E+12 = 1.00E+00 = 1.00E+07 = 9.68E+01 = 1.90E+01 = 3.00E+01 = 3.00E+01 = 2.00E+01 =						
2 4.06 ± 0.1 0.1.36 ± 0.0 0 0.6.31 = 1.00 ± 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.0 0.	6		٠	•		
9.96E-01 0 4.10E-01 0 8.62E-08 0 4.07E-06 0 1.90E-12 0 1.33E+00 0 9.60E-11 0 8.00E-01 0 1.00E+07 0 1.90E-12 0 1.33E+00 0 9.60E-11 0 8.00E-01 0 1.00E+07 0 1.00E-07 0						
4.90E+01 • 4.10E+01 • 8.62E+08 • 4.07E+06 • 1.90E+12 • 1.33E+00 • 9.60E+11 • 8.00E+01 • 1.00E+07 • 9.22E+01 • 2.56E+11 • 8.00E+01 • 2.10E+01 • 3.30E+01 • 1.60E+01 • 3.38E+01 • 3.48E+01 • 3.48E+01 • 3.48E+01 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 2.10E+01 • 2.10E+01 • 3.20E+01 •					٠.	٠.
4.90E+01 • 4.10E+01 • 8.62E+08 • 4.07E+06 • 1.90E+12 • 1.33E+00 • 9.60E+11 • 8.00E+01 • 1.00E+07 • 9.92E+01 • 2.96E+11 • 8.00E+01 • 2.00E+01 •		-			•	•
4.90E+01 • 4.10F-01 • 8.62E-08 • 4.07E-06 • 1.90E-12 • 1.33E+00 • 9.60E-11 • 8.00E-01 • 1.00E+07 • 9.92E-01 • 2.86E-11 • 8.00E-01 • 1.00E+07 • 1.00E-03 • 1.00E-05 • 5.00E+01 • 2.10E+01 • 2.40E-11 • 1.00E+00 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 2.10E+01 • 2.10E+01 • 2.10E+01 • 2.40E-11 • 1.00E+07 • 1.00E+07 • 1.00E-05 • 5.00E+01 • 3.00E+00 • 2.10E+01 • 2.10E+01 • 2.40E-11 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 2.10E+01 • 2.40E-11 •						
4.90E+01 • 4.10E-01 • 8.62E-08 • 4.07E-06 • 1.90E-12 • 1.33E+00 • 9.60E-11 • 8.00E-01 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 1.00E+01 • 2.00E+01 • 2.40E-11 • 1.00E+00 • 1.00E+07 • 2.40E-11 • 1.00E+07 • 1.00E+07 • 1.00E+07 • 2.40E-11 • 1.00E+07 • 2.10E+01 • 2.40E-11 • 1.00E+07 • 2.10E+01 • 2.40E-11 •	•		٠	•	•	
3.30f+01 = 1.80f+00 = 3.98f-10 = 8.36f-09 = 1.00f+07 = 1.00f+09 =		0 .				•
3.30f+01 = 1.80f+00 = 3.98f-10 = 8.36f-09 = 6.53f-14 = 1.05f+00 = 1.60f-11 = 1.00f+00 = 1.00f+00 = 1.00f+01 = 2.40f-11 = 1.00f+01 = 3.00f+01 =					٠.	٠.
3.30f+01 * 1.80f+00 * 3.98f-10 * 8.36f-09 * 6.53f-14 * 1.05f+00 * 1.60f-11 * 1.00f+00 * 1.00f+00 * 1.00f+01 * 9.68f-01 * 2.40f-11 * 1.00f+00 * 2.10f+01 * 2.40f-11 * 1.00f+00 * 2.10f+01 * 2.40f-11 * 2.40f-11 * 2.40f-11 * 3.00f+00 * 2.10f+01 * 2.40f-11 * 3.00f+00 * 2.10f+01 * 2.40f-11 * 2.40f-11 * 3.40f+01 *	9 0				• 0	•
3.30E+01 = 1.50E+00 = 3.98E-10 = 8.36E-09 = 6.53E-14 = 1.05E+00 = 1.00E+00 = 1.00E+07 = 1.00E+01 = 2.40E-11 = 1.00E+01 = 2.10E+01 = 3.00E+01 =		!			• • • • • • • • • • • • • • • • • • • •	
3.30f+01 = 1.50f+00 = 3.98f-10 = 8.36f-09 = 6.53f-14 = 1.05f+00 = 1.60f-11 = 1.00f+00 = 1.00f+07 = 1.00f+01 = 2.40f-11 = 1.00f+00 = 1.00f+01 = 2.40f-11 = 1.00f+01 = 2.40f-11 = 1.00f+01 = 2.40f-11 = 3.00f+01 = 2.40f-11 = 3.00f+01 = 2.40f-11 = 3.00f+01 = 2.40f-11 = 3.00f+01 = 2.40f-11 = 3.40f+01 =	•		•	• •	••	
9.68£-01 o 2.40£-11 o 1.00€+00 o 1.00€-03 o 1.00€-05 o 5.00€+01 o 3.00€+00 o 2.10€+01 o		6	o	•		
			+ 0 -			٠.
!			•	•		
• •	0 0				• •	!
	0 0		• •	• •	• •	

CIRAL FLAGS	. 0	0 + 0	0 + 0 184A		0 + 0 3ddl 0 3ddl	C-880V • E-880V	SURGE ZC SURGE ZE
	8-17 108 1-8	REST ST R	SURGE C-	• 0 0 0	SURGE E-B	DAMAGE K (<50NS) C-8 (REF)	DAMAGE K (>50NS) (-8 E-9
	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	9 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	(-8 KFF)	• • • •	(K K F F)	x x	X 33 0 0
1 573375 T	2 13 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2	1,772-08 ° 7,90E-09 7,13E-01 ° 1,00E+07 3,70E+01 ° 7,90E+01	5 7 H	6.00E-11 0 1.19E+00 0 1.00E-03 0 1.00E-05 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.59E-11 0 1.68E+00 6.50E+01 0 4.00E+00 1.56E-04 1.13E-04	1.00E+07 0 3.88E-11 4 3.70E+03 0 9.60E-01 6.97E-01 5.06E-01
243433	3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		0 + 6 + 0 0 + 0 0	1.85£.00 (34)	5.386-06 1.276-04	4.75E+03 * 1.85E+00 4.75E+03 * 1.85E+00 5.41E-02 5.70E-01
243440	0 * 0 *	3 • 0 • 0 0 • 9 0	1.77E-00 0 3.18E-06 5.00E-01 0 1.00E-07	0 + 0 + 0 0 + 0 0 0 0	1. 00 £ -0 5 0. 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	3.00E.02 0 7.00E.00	2.106.01 • 2.106.01
ZN3436 (II)	0.0.0	1.91477 1.91477 1.91471 1.91471	1.79E-10	2 7 0	5.048E-13 • 1.08E+00 • • 1.00E-05 • • • • • • • • • • • • • • • • • • •	1.48E-11 • 9.00E-01	2.10f+01 0 2.10f+01

TRANSISTOR DEVICE LIBRARY (Cont'd)

UEVILL NAME .	T T T T T T T T T T T T T T T T T T T	HEEI O	N +		105 • #0		• • • • • • • • • • • • • • • • • • • •	VCB1	RCL .	165
(TRAC FLAG)	BULK RESIST	CEO	VEBI * RE	C-B	SURGE E	1 pp	> 1 3	* (<50NS) **	SURGE ZC . SURGE Z DAMAGE K (>50NS)	(>50NS)
			(REF)		(REF)		(REF)	1		
	(REF)	E-8	C-8 (REF)	F-8	C-8 (REF)	89 1	(REF)	• • •	(REF	
2834 99	9 • 9286 • 010 • 1	160111111111111111111111111111111111111	5.946-10	2.25E-07 0	6.93E-13 ° 1.00	1.05E	2.40E-11 • 1.00E+02 •	9 + 0 + 0 + 0	1.00 £ +07 · 5.	2.10E+01
2N3509	1.53£.02 ° 2	0 0 + 0 + 0 + 0	9 . 0 . 6	1.17E-08	4.07£-14 ° 1.0	1.01F.00 1.00F-05	2.95f-12 • 4.00f+01 • •	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.00E+07 • 2.	2.97E-15
243553		345. 1000 1000 1000 1000 1000 1000 1000 10	0 + 0 + 1 6	1 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	1.971-14 • 1.0	1.0046.00	2.94 E-11 9	8 4 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.00 E+07 • I.	1.36F-13
27356	0.00	1000	5 5 1 3 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	9994	4.00£-09 ° 9.9	9.94k-01	2.006+01	2.00 E - 01	2.106+07 • 4.	4.00 E-09

	EULK RESISTANCE (-0) (KEF) E-8 C-8 FUKARD (AFF)	7 SURGE (-B 1005 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1 SUR CE E-B 1 US (REF) C-B (REF)	C-880V • E-880V • C-880V • C-8	SURGE ZC • SURGE ZE DAMAGE K (>SONS) C-B (REF) KREF)
58888	6.00E-02 2.60E-01 (34)	2.15£+03 2.15£+03 0	1.30E+00 4.15E+00 (34)		2.15E+03 + 1.30E+00 3.60E-01 2.30E+00
243632	1.516.01 € 2.546.00	1.97£-09 ° 9.83£-08 ° 8.00£-01 ° 1.00€+07 ° 8.00€-01 ° 1.00€+07 ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° ° °	5.38E-13 0 1.10E+00 0 1.00E-03 0 1.00E-05 0	6.93£-11 • 8.00£-01 • 6.50£+01 • 4.00£+00 • • • • • • • • • • • • • • • • • •	1.00f+07 • 7.67E-15 2.10f+01 • 2.10f+01
243633	2.49£+02 • 1.000£-01 9.68£-01 • 1.60£-12	5.58E-11 9.00E-01 1.28E-10 1.28E-10 1.00E+07	7.40E-14 • 1.08E+00 • 1.00E-05 •	2.40f-12 • 1.00f+00 • 1.50f+00 • 1.50f+01 • 4.00f+00 • 1.50f+01 • 4.00f+00 • 1.50f+01 •	1.00E+07 • 8.30E-15 2.10E+01 • 2.10E+01
2N3723A (1)	3.86£-02 ° 7.39£-11	9.44E+02 • 4.02E+03 • 7.50E-01 • 1.00E+07 •	1.12f-11 a 1.16f+01 a 1.00f-05 a 1.00f-05 a	2.24E-11 • 7.30E-01 • 1.00E+02 • 6.00E+00 •	1.00E+07 • 1.70E-13 2.10E+01 • 2.10E+01

DEVICE NAME .	HFEN . HFEI		10S • NC	. 180A . 000	RCL • 1ES
(TRAC FLAG) .	X.	e VEBI . REL .			SURGE ZC . SURGE ZE
	1	SURGE	Z SURGE F-8	DAMAGE K (<50NS)	DANAGE K (>50NS)
9	(REF)	* (REF)	(REF.)	(REF.)	(REF)
	K FORWARD	×	 ×	· · ·	
0 0	(-8 (REF)	o (-8 E-8 •	(REF) E-B	(REF)	(REF.)
2N37238 (111	1.30E+01 • 5.00E-02 1.07E+00* • 6.48E-11	4.18E-09 • 3.14E-09 • 8.00E-01 • 1.00E+07 • • • • • • • • • • • • • • • • • • •	1.01E-10 • 1.17E+00 • 1.00E-05 •	1.30£-11 • 1.00£+00 • 1.00£+00 • 1.00£+02 • 6.00£+00 • 1.00£+02 • 6.00£+00 • 1.00£+02 •	2.10f+01 + 1.40f-12 2.10f+01 + 2.10f+01
2N3723C	1.73£+01 • 1.07£+00 1.06£+00 • 7.60£-11	3.12E-09 • 3.77E-08 • 8.00E-01 • 1.00E+07 • • • • • • • • • • • • • • • • • • •	6.96E-12 • 1.19E+00 • 1.00E-03 • 1.00E-05 •	1.34E-11	1.00E+07 • 5.08E-13 2.10E+01 • 2.10E+01
2437230	1.13E+01 * 7.61E-01 1.01E+00 * 1.65E-11	3.03E-09 • 3.46E-08 • 6 50E-01 • 1.00E+07 • • • • • • • • • • • • • • • • • • •	4.17E-14 ° 1.07E+00 ° 1.00E-05 °	7.76E-12 • 7.80E-01 • 1.00E+02 • 6.00E+00	1.00E+07 • 4.68E-15 2.10E+01 • 2.10E+01
2N3723E	1.08E+01 • 7.17E-01	6 5.13E-09 • 3.17E-08 • 6.00E-01 • 1.00E+07 • • • • • • • • • • • • • • • • • • •	1.10E-10 • 1.19E+00 1.00E-03 • 1.00E-05	9.84E-12	2.10E+01 • 2.10E+01

	BULK RESISTANCE	STANCE	VEBI • RE	REL C-8	IPPC . IPP	1 P P E	C-880V F-880	E-880V	2.0 × 3.0	* SURGE ZE
		A R D	(REF)		(REF)	E-B	(REF.)		## ## ## ## ## ## ## ## ## ## ## ## ##	
2N3723F CL1	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6.046-01	3.246-09	2.81E-08 1.00E+07	5.71E-12 • 1.00E-03 •	1.14 E + 00	9.62E-12 *	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.00£.07 •	3.226-13
2N3828 (1)	2 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 - 4 -	2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	80 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.406-13	0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6.80E-12 •	7.50E-01 •	1.00 E + 07 + 2.10 E + 01 +	2.106.01
283866	1.00 1.00 1.00 1.00 1.00 1.00 1.00 1.00	1.006-01	8 . 10 6 - 10 . 8 . 50 6 - 01	1.616.08	1.39E-13 0	9.90011	5.50E+01 •	3.50E-01	2.10 6.01	1.26£-13 2.10£+01
24366A	8 1 1 0 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0	2.306.00	8 - 60 E - 10 • 8 - 60 E - 01 • •	1.00£+07	1.02E-14 •	1.06£+00 1.00£-05	7.56E-12 • 5.50E+01 •	8 . 20E-01 3 . 50E+00	1.00E+07 •	5.59E-15

PAGE 28

(TRAC FLAG)	BULK C-B	7 SURGE C-8 1005	100 E E-8 1005 6 1005 6	C-880V ° E-880V ° C-880V ° C-8 (REF)	2 2
	(C-8	8-0 8-1 8-1 8-1 8-1 8-1	x 33	x (3)
2N38668	2	8.60E-01 0 1.00E+07	1.65E-14 • 1.08E+00 • 1.00E-05 •	8.06f-12 * 8.20f-01 * 5.50f+01 * 3.50f+00 *	1.006+07 • 6.44E-15 2.10E+01 • 2.10E+01
2N3866C	6.60E+000 1.04E+000 1.51E-11	1.22E-09 • 2.73E-08 8.60E-01 • 1.00E+07	1.00E-03 * 1.00E-05	7.36E-12 • 7.80E-01 • 5.50E+00 • 1.50E+00 •	1.00 E+07 e 7.25 E-15 2.10 E+01 e 2.10 E+01
243666D	7.10£+00 • 3.40£+00 1.01£+00 • 1.65£-11	8.77E10 • 4.36E-08 8.50E-01 • 1.00E+07	2.33E-14	7.76E-12 • 7.80E-01 5.50E+01 • 3.50E+00	1.00E+07 • 4.91E-15 2.10E+01 * 2.10E+01
2N3866 E	8.30E+00 e 5.00E+00 9.90E-01 e 1.74E-11	8.70E-10 0 1.69E-08	9.60E-15 9 1.06E-00 1.00E-03 9 1.	8.05E-12 * 8.00E-01 5.50E-01 * 3.50E+00	1,00E+07 0 2,02E-15 2,10E+01 0 2,10E+01

PAGE 29 RCL • IES SURGE ZC • SURGE ZE DAMAGE K (>SONS) C-8 (REF) K	1.00E+07 • 2.75E-14 2.10E+01 • 2.10E+01	2.10E+07 • 3.43E-07	1.00E+07 • 1.04E-10 1.22E+02 • 2.35E+02 1.20E+00 1.39E-01	1.31E.03 1.10E.03 1.42E-01 1.56E-01
CCG	7.60E-12	2.53E-11 • 1.40E+00 • 2.50E+01 • 1.50E+01 •	8.49E-12 • 5.00E-01 • 6.00E+00 • 2.69E-04 • 3.11E-05 • 6.00E	
1CS	3.20E-13 • 1.14E+00 • 1.00E-05 •	3.50f-07	1.04E-10 • 9.94E-01 • 1.00E-05 • 1.00E-05 • 1.28E+03 •	1.10f+03 1.40f+03 (34)
VERI SURGE (-B 100 S (REF) C-B (REF)	7.29E-10 • 2.86E-08 • 8.70E-01 • 1.00E+07 •	7.96E-09 • 7.96E+08 • 1.40E+07 • 1.00E+07 • 1.40E+07 • 1.00E+07 • 1.40E+07 •	3.18E-09 0 1.59E-07 0 5.00E-01 0 1.00E-07 0 5.00E-01 0 1.00E-07 0 5.05E+02 1.47E+02 0 6.05E-02 0 6.05E-03 0 6.	1.186+03 1.186+03
HFEN MEEN	1.02E+01 1.01E+00 1.01E+11 1.01E-11	1.50£+02	1.00E+01 • 9.00E+00 • 9.94E-01 • 9.94E-01 • 1.41E-11 • 4.40E+01 • 3.80E+01 • 6.14E-04 •	4.25E-01 1.35E+00 (34) 1.80E-02 3.20E-03
(TRAC FLAG)	243866 F	2N 36 8	2N3 93 3	(0)

TRANSISTOR DEVICE LIBRARY (Cont'd)

· VCBI · RCL · IES	· E-BBDV · SURGE ZC · SU	. DAMAGE K (>5	(REF) (AEF) (REF)		(REF)	11 • 5.00E-01 • 1.00E+07 • 5.00E-07 11 • 1.20E+01 • 2.10E+01 • 2.10E+01	12 • 8.00E-01 • 1.00E+07 • 3.45E-14 13 • 4.50E+00 • 2.10E+01 • 2.10E+01	12 • 8.00E-01 • 1.00E+07 • 2.54E-15	12 * 8.00E-01 * 1.00E+07 * 2.56E-15 * 4.50F+00 * 2.10E+01 * 2.10E+01
	. C-88DV	. DANAG	9-3		• •	2.50E-01	2.86E-12 	2.68E-12	2.68E-12 +
¥	IPPE	E E-8	1003	'	F.)	1.216.00	1.04£+00	1.15£+00	1.15E+00 1.00E-05
103	. JAdi	Z SURGE E-B	IUS	. ×	(-B (REF)	5.00E-07 • 1.00E-03 •	1.006-03	5.61E-14 • 1.00E-03 •	5.62E-14 °
-	REL	C-8	5001	• •	e e	1.596-07	1.005+07	1.08E-08	7.97E-09 °
	vE81	Z SURGE C-B	IUS (REF.)	×	C-B (REF)	3.986-08	8.00E-01 •	8.50f-01 •	1.17E+10 ° 8.50E-01 °
HEEL	ceo .	ANCE	n •		8 - 8	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	. 80 E -01 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	.32£+00 .
HEEN		R RESIST	(SEF)	K FURNAR	C-8 (REF)	1.21E+00 1.21E+00 1.21E+00	1.13 E + 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4.01E.01 • 1.03E.00 • 2	4.29E+01 • 1 1.03E+00 • 2
DEVICE NAME &	(TRAC FLAG) .		0 0	9 9	0 0	2N404	2N4209 (1)	244209A (1)	2N42098 9

TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME (TRAC FLAG)	2 + 0	HFE1 .	1N VEB1	TI REL .	ICS •	MC + •	. CCO	F-BBDY *	SURGE ZC * SURG	18.5 SURGE 28
	1 8	RESISTANCE .	Z SURGE C-B	+ 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0	Z SURGE E-8	E-8	144	K (<50NS) *	* *	H S J
	0	6 6 6	(REF)	1002	TUS (REF)	1005	(REF)	. E-3	(REF)	200 I
	R FURKAR	1. 1002	* ×	+ 0	×		*		*	
	(REF)	F) F-B	(REF)	20	(REF)	e *	(REF)		(REF)	
2N4209C	0 + 0 + 1 1 1 1 1 1 1 1 1 1	2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	0 0 0 0 0 0 0 0 0 0	0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 + 0 +	1	1.07F+00 1.00F-1	3.02E-12 • 1.50E+01 •	6 .00E-01	1.00E+07 * 1.0 2.10E+01 * 2.1	2.16E-14
	6	0		•		•		•		A TOP
2N42090	000000000000000000000000000000000000000	2.646-12	2.27f-130 9.00f-01	1.00f+07	S 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1.00 6-0 5	2.68E-12 1.50E+01 •	* * * * * * * * * * * * * * * * * * *	1.00£+07 • 5.1 2.10£+01 • 2.1	2.106+01
2N4209E	4.30E+01 1.12E+00 4.00	1.24E+00 **	1.17E-10 •	9.41E-09.	8.31E-11.	1.19E+00	2.80E-12 *	8.00E-01 4.50E-00	1.00E+07 • 2.3 2.10E+01 • 2.1	2.35E-12 2.10E+01
	0000	6 + 9 9	1 1 1 1 1 1 1 1	1 1	1 1 2 2 3 4 4 3				5 5 5 7 1 1	t t t
284209F	4.36EF+01	1.50£+00 •	9.786-11	1 . 0 0 E - 0 9	4.17E-12 •	1.14E+00 1.00E-05	2.68E-12 • 1.50E+01 •	4.50E-01	1,00E+07 + 3,0 2,10E+01 + 2,1	3.07E-13
		+ 0 0							1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	-

TRANSISTOR DEVICE LIBRARY (Cont'd)

TRAC FLAG		100 S S C C C C C C C C C C C C C C C C C	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	105 C E E E E 10U 105 C E E E E E E E E E E E E E E E E E E	w w m	C-880V • E-880 C-880V • E-880 C-8 (REF) · · · · · · · · · · · · · · · · · · ·		SURGE ZC • SURGE DAMAGE K (>SONS) C-8 (REF) K REF)	SUBGE 2E (>50NS)
2N 4 2 5 1 B 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	4,48E-1	2.856-09	3.376-11 • 1.4	1.00 E E + 00 0 0 0 0 0 0 0 0 0 0 0 0 0 0	4.045-12 0 7.	4.506-01	2.106+07 • 1.	2.101-12
2842516	1.72E+02 1.72E+02 1.06E+00 0 5.21E-12	6 + 6 + 6 0 + 6 1	2. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1.	3.388-14 • 1.01	0 • • • • • • • • • • • • • • • • • • •	1.50E+0112	6 + 6 + 6 0 + 6 0	2.10£+07 ° 4	2.10E+01
2442510	1.70E+02 1.70E+02 1.19E+00 4.92E-12 4.92E-12	4 0 + 0 + 0 0 + 0 0 + 0 0 + 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	1.48E-14 0	100 EF	3.58f-12 ° 7.	7,506-01	2 . 10 6 6 7 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	2,51E-13
2842510	1.59E+02 0 1.60E+01	7 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	3.111-09	3.936-14	1.02EF	3.52 1.55 1.55 1.55 1.55 1.55 1.55 1.55 1	4 + 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	2.10F+01 + 4	2.10 € + 0.1

TRANSISTOR DEVICE LIBRARY (Cont'd)

	11111	CED	v VEB1	REL .	• 3441	1PPE .	C-88DV . E-88DV	V . SURGE ZC	SURGE 1E
	BUL A	RESISTANCE E-B (REF)	2 SURGE 105 (REF	5-	Z SURGE E-B 1US 101	E-B	DAMAGE K (<50NS) C-B E-B	DAMAGE K (>50NS) (-B E-B (REF)	K (>50NS) E-B (REF)
	¥ 8	FURNARD E-8	C-6 (REF)	F-8	(-8 K	F-8	× 3	+ • • •	× 1
2N4251E	1.796+02	4.531-12	5.17f-11 • 9.00f-01 •	3.616-09	4.53E-14 • 1.00E-03 •	1.07f+06	3.52E-12 * 8.00E-01 1.50E+01 * 4.50E+00	2 . 1 . 00 E	3.8
2N4251F (1)	20 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	4 4 80E-12	* 1	6 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	5.66E-14 • 1.00E-03 •	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	3.58E-12 0 8.00E-01	01 1.00 € 07 0	2.10£+01
2N42 EM (O)	5.601-0	34) 1.84F.00	9.755.02	9.756.02	9.786.02	1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4.25E-05 (60)	4.40E+02	2.91E-01
(0)	9.946-01	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	6.00E+01 •	2.00£.01 .	2.10f+01 1.00f+01	2.10E+01 0 5.00E+00 0	3.70E-07 • 1.59E-06	11 0 1.00 E+07 0	5.00E-09

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DEVICE NAME	0	HEEN O HEEL	TN 0 11	1 (S * MC *	cca • vcB1 •	RCL . 1ES
					• •	2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3
(TRAC FLAG)				e Jobe o Jobe	* 1088-3 * 1088-3	
	0 0	BULK RESISTANCE	Z SURGE C-B	SURGE E	GE K (<50	E K (>50
	6	8-3	1005	100 100 1000 0	6 8-3 (214)	8-3 EEE
	0 0	(4[+)	(NEF)		•	
	0	N FURNARE	×	×	×	*
	6 0	(-8 (8ff) f-8	(REF.) t-8	(REF)	(REF)	(REF)
			[] ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ; ;	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
244664	0	٠	0	•		
63	0 0	+ 0		• • • • • • • • • • • • • • • • • • • •	• •	6.80E+02 . 6.20E+02
	0 0 0	1.306.00 1.856.00	6.80F+02 2.41F+02	5.00E+02 2.80E+02 0	1.42E-04 1.34E-04 0	6.33E-01 6.01E-01
	0 0 0			+ 0 0		1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
2N501A T0	6	8.00E+61 + 2.00E+90	. 1.77E-10 . 3.18E-09	. 1.10E-06 . 1.22E+00 .	2.69E-12 • 6.65E-01	1.006+07 * 1.146-06
(1)	0 0	1.226+30 \$ 4.906-12	8.62E-01 0 1.00E+07	-	1.50E+01 . 2.00E+00 .	3.15E+01 . 4.20E+01
	0 6	5.10E+50 8.40E+00	3.55E+02 4.70E+02	2.60E+02 1.01E+03	3.40E-06 4.95E-06	1.52E-02 2.22E-02
	0 0	(36)	() ()	• • • • • • • • • • • • • • • • • • • •		
	o a	109		•		
2N526 T	6 (1.00E+01 . 9.00E+00	1.59E-09 ¢ 7.96E-09	6.00E-09 0 9.94E-01	4.24E-12 • 5.00E-01	1.00 E+07 . 6.00 E-09
(1)	9 0	010	1 . 1	3 0 1	4.50£+01 • 1.50£+01	2.10E+01 • 2.50E+02
	0 0		•	• •		
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	o			٠		
2N5 629	0 (e	• •	• •	• •	
(0)	5 0					9.25E+01 0 1.80E+01
	0 0		. 6.25E+02 1.50E+03	1.80E+01 1.80E+01	2.90E-06 2.05E-06	1.30f-02 9.18f-03
	9 0 0	4.705-115, 1.40F-05				
	0	(09	. 0	۰		

TRANSISTOR DEVICE LIBRARY (Cont'd)

	DEVICE NAME	1	o hFEI		0 N	11 0	105) X	0 000	VCBI .		16.5
	FLAC)				VE81	REL	1990	+ 0	+ 0				SURGE ZE
(1) 2.50E-01 1.00E-01 2.50E-01 1.00E-02 1.00E-03 1.00E-03 3.50E-01 3.00E-01 1.00E-02 2.50E-01 2.50E-01 2.50E-02 2.50E-03 1.00E-03 3.50E-01 3.50E-01 1.00E-03 2.50E-01 2.50E-01 2.50E-03 2.50E-03 2.50E-03 3.50E-01 3.50E-01 1.00E-03 2.50E-01 2.50E-03 2.50E-03 2.50E-03 2.50E-03 3.50E-03 3.50E-03 3.50E-03 3.50E-03 3.50E-03 2.50E-01 2.50E-03 2.50E-03 2.50E-03 2.50E-03 3.50E-03 3.50E-03 3.50E-03 3.50E-03 3.50E-03 3.50E-03 2.50E-03 2.50E-03 2.50E-03 2.50E-03 2.50E-03 3.50E-03 3.50E-0		BULK	ESISTANCE F-R	• 0 0		G-8	1	RGE E-E	+ 0 0	DAMAGE K	(<50NS)		>50NS)
(1)			8681							(86	f) .	(866	
		2 10	-	0 6		G 6	a-)		0 0	*		×	
1.00E+01 = 1.00E+01 = 2.0E+-0E = 3.18E+07 = 1.00E+08 = 9.94E+01 = 2.3E+11 = 5.00E+01 = 1.00E+07 = 1.00E+07 = 1.00E+08 = 9.94E+01 = 2.3E+11 = 5.00E+01 = 2.10E+01 =			- 1	0 1	- 1	1	-	1	0 1	(RE	F) 0	IREF	,
(10) 2.50E-01	24598			o				0	4E-01 °		5.00E-01	1.00E+07	1.806-08
(1) 2.50E-01 1.00E-00 (32) 1.00E-02 (32) 2.00E-02 (32) 4.50E-02 (32) 2.00E-03 (32) 2.00E-01 1.00E-07 2 (32) 2.00E-01 2 (32)				+ 0 + 0				+ 0 +	00E-05				1.60 € + 02
2.50E-01 1.00E-01 1.00E-01 1.59E-09 7.50E-09 9.94E-01 4.54E-12 5.00E-01 1.00E-07 1.00E-01		1		0 + 0 0	# # # # #						0 + 0 0		
2.50E-01 1.00E+00				0 + 1		1	1 1 1 1 2	0 * 1		0 + 1	0 + 1		
1.00E+01 • 0.00E+00 • 1.59E+09 • 7.56E+09 • 9.94E+01 • 4.54E+12 • 5.00E+01 • 1.00E+07 • 1.00E+01 • 4.54E+12 • 5.00E+01 • 1.00E+07 • 1.00E+01 •			323	+00	1	• 20-300-9	,	32.1	101.02		+ 0 0		1
1.00E+U1 • 0.00E+U0 • 1.59E-U9 • 7.96E-U9 • 9.94E-D1 • 4.54E-12 • 5.00E-U1 • 1.00E+U7 • 1.00E-U3 • 1.00E-U3 • 1.00E-U1 • 3.00E+U1 • 0.00E+U7 • 1.00E+U7 • 1.00E-U3 • 1.00E-U1 • 0.00E+U1 •								1				# ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ± ±	\$ 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8 8
1.00E+01 • 7.07E+12 • 5.00E+01 • 1.00E+03 • 1.00E+03 • 1.00E+01 • 3.00E+01 • 6.00E+02 • 1.00E+01 •				0 +		7.968-09	6.008-09		4 F-01 0		5.00E-01		6.00E-09
1.00E+01 • C.00E+01 • 1.59E-08 • 7.99E-10 • 9.94E-01 • 7.07E-12 • 5.00E-01 • 1.00E+07 • 1.00E+01 •				0 + 0		1.COE.07 0	1.006-03	0 +	0.E-05 °	3.501.01	3.00£+01 °		4.30E+02
1.00E-01 • C.00E-05 • C.65E-09 • 1.59E-06 • 7.99E-10 • 9.94E-01 • 7.07E-12 • 5.00E-01 • 1.00E+07 • 5.00E-01 • 1.00E+07 • 5.00E-01 • 1.00E-01 •				0 * 0 0		1 1						* * * * * * * * * * * * * * * * * * *	1
**************************************				0 .		1.596-06	7.99E-10	0 +	48-01 0		5.00E-01 •		7.99E-10
+ 0 0						• • •	1,001-03				5.00E+10	2.10E+01	2.101.01
						+ 8 (1	1			+ 0	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1

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SURGE ZC + SURGE ZE DAMAGE K (>> SURGE ZE C-B (REF)	1.00E+07 • 6.98E-15 • 3.20E+00	1.00E+07 • 4.00E-17 2.10E+01 • 2.10E+01	1.00E+07 • 4.00E-17 2.10E+01 • 2.10E+01	1.00E+07 • 1.00E-05 7.25E+01 • 1.65E+02 1.42E-02 5.06E-03
C-000 0 VCB1 0 CC0 0	2.47E-10	6.00E+01 • 5.00E-01 • 1.	4.95E-11 • 5.00E-01 • 1.	1.37E-11 • 3.00E-01 • 1.50E+01 • 1.50E+01 • 3.50E+00 • 7.50E+00 • 1.13E-06 • 1.3E-06 •
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TRANSISTOR DEVICE LIBRARY (Cont'd)

DEVICE NAME		e .		105	000	RCL • 1ES
(TEAC FLAG)	* 6	. VES1	REL			SURGE ZC . SURGE ZE
	BULK RE	SUR 2	Z SURGE C-B	Z SURGE E-B	GE K (<5	OAMAGE K (>50NS)
	(AEF)	SD1 0	(REF.)	(REF)	(REF)	(865)
	B FURNARD	• •	+ 0	×	· ·	
	c-6 (8EF)	6-9 6-8	(REF) 6-6	C-B (REF)		(8.6)
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28743	4.90E-01	6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	4.32E-08	1.49f-14 ° 1.02f+00 1.00f-03 ° 1.00f-05	00 • 5.30E-12 • 8.00E-01	2.10E+01 0 3.26E-14
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DEVICE NAME B	2 · 0	e • 033	0 • 0 183A		105 · • • • • • • • • • • • • • • • • • •	0 + 0 3 d d l	CCD 7	VCBI	SURGE ZC .	SURGE ZE
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DEVICE NAME O	HFEN O HFEI O	TN 111	ICS • MC • IPPE •	CCG • VCBI	SURGE ZC . SURGE ZE
	BULK RESISTAN C-8 (REF)	Z SURGE C- 1US (REF)	Z SURGE E- 105 (REF)	DAMAGE K (<50NS) C-B (REF)	DAMAGE K (>50NS) C-8 FF)
	× 8 - 1	(REF)	(REF)	(x x	, x
28214	2.60E+01 a 1.10E-01 9.92E-01 a 5.90E-12	8 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 - 0 -	1.00E-03 + 1.00E-05 + 1.00E-03 +	4.70E-12 • 9.00E-01 4.00E+01 • 5.00E+00	1.00E+07 • 6.54E-15 2.10E+01 • 2.10E+01
24415	9.07E+U2 0 3.30E-01 9.08E-01 0 7.10E-12	5.15E-10 • 4.46E-07 • 9.00E-01 • 1.00E+07	3.75E-11 e 1.43E+00 e 1.00E-03 e 1.00E-05 e	4.60E-12 * 8.00E-01	1.00E+07 • 6.66E-15 2.10E+01 • 2.10E+01
274516	7.30f-1 7.30f-	9.005E-10 • 3.89E-07	1.93E-13 • 1.11E+00 1.00E-03 • 1.00E-05	6.70E-12 • 9.00E-01	1.00E+07 • 4.95E-15 2.10E+01 • 2.10E+01
2N518	1.02133	1.76E-11 0 2.25E-08 1.00E+00 0 1.00E+07	3.20E-15 + 1.02E+00 1.00E-05	3.00E+01 + 3.00E+00	1.00E+07 • 1.65E-15 2.10E+01 • 2.10E+01

	BUCK C-B	RESISTANCE (REF)	2 SURGE (-B 105 (REF)	REL C-B 1000S	1 SURGE E-B 1 US (REF)	1PPE E-8 10US	C-BBDV C-BBDV C-BDAMAGE K (< C-B	* E-BBOV ** * (<50NS) ** * E-B **		SURGE ZE >50NS1 E-B
		8.0	C-B (REF.)	8-1	0 - B	89	X S	• • • •	R K	
27.	9 + 6 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	7.20E-12	9.036-10	5.00 E - 0 8	1.206-13 •	1.05E+00	5.00E-12 • 4.50E+01 •	5 00 10 10 10 10 10 10 10 10 10 10 10 10	1.00£+07 •	3.60E-15 3.70E+00
2N 955A (1)	9.00	4	8.95£-11 • 5.00£-01 • +	4.29f-09	8.05E-06 •	1.08E+00	6.00E-12 6.00E-12 1	5.00E-01	1.00E+07 • 2.10E+01 •	2.106+01
797.72	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	6 . 2 6 E - 1 0 9 5 . 0 0 E - 0 1 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	1.00 E - 0.9	1.446-06 9	1.006	3.20E-12 • 1.50E+01 •	5.00f-01 2.50f+00	1.00£+07 • 2.10£+01 •	3.506-07
249726A (1)	1.7796	8 - 8 - 3 - 1 - 1 - 2 - 2 - 2 - 3 - 3 - 3 - 3 - 3 - 3 - 3	8	1.34£-08	1.726-12 •	1.226.00	9.93E-12 • 1.00E+01	7.506-01	1.00F+07 •	4.22E-14

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TRANSISTOR DEVICE LIBRARY (Cont'd)

PAGE 42

		1 6	2	0 11	10.5	0 V	0 777	VCBI o	RCL . IES
				+ 0	. 0	+ o	C-88DV **	E-880V .	SURGE ZC . SURGE ZE
(TRAC FLAG)	2	o • ·	VEB1 0 KEL	. + 6	2 SURGE F-8	+ 0	u.	K (<50NS) *	×
	C-8-7	6-8 6-8	105 (REF)		1US (REF.)	1005	(-B (REF)	0 6 0 6	(-8 EF)
					*		· ×	1 1 1 1 1	· ×
	C-B (REF.)	F-8	C-B (REF.)	8-3	(-8 (REF)	E - B	(REF.)	9 6	(REF.)
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TRANSISTOR DEVICE LIBRARY (Cont'd)

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GE K (>50NS)	DAMAG	0	(<50NS)	×	DAMAGE	0	E-8	JRGE	15 2	0	8-0	JR GE	15 7	0	BULK RESISTANCE	REST	BULK	0	
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RCL * IES	RCL	٥	VCBI	0	000	0	MC		105	0	II o	•	N.	0	HFEI	6	HFEN	*	DEVICE NAME .

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END OF LISTING

TABLE III. DEVICE PARAMETER REFERENCES

CODE	REPORT
001	Preliminary ReportSemiconductor Damage Study, Braddock, Dunn, & McDonald (23 December 1968).
002	D. C. Wunsch and L. Marzetelli, BDM Final Report Volume 1, Semiconductor and Non-Semiconductor Damage Study, Braddock, Dunn, & McDonald 375-69-F-0168 (April 1969).
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004	Braddock, Dunn, & McDonald, Final Summary Report on Semiconductor Damage Study Phase II, BDM/A-84-70-TR (February 1971).
005	D. C. Wunsch et al, Semiconductor Vulnerability Phase II Report, Theoretical Estimates of Failure Levels of Selected Semiconductor Diodes & Transistors, AFWL-TR-73-119, Vol 1 (July 1973).
006	D. C. Wunsch, R. L. Cline, and G. R. Case, Semiconductor Vulnerability Phase II Report, Braddock, Dunn, & McDonald/A-42-69-R (December 1969).
007	J. B. Singletary, W. O. Collier, and J. A. Meyers, Semiconductor Vulnerability Phase III Report, Braddock, Dunn, & McDonald/A-75-70-TR (August 1970).
010	D. L. Durgin et al, Methods, Devices, and Circuits for the EMP Hardening of Army Electronics, ECOM-0275-F, Braddock, Dunn, & McDonald/A-119-72-TR (July 1972).
011	Boeing Aerospace Company and Braddock, Dunn, & McDonald, EMP Susceptibility of Semiconductor Components, Boeing, Braddock, Dunn, & McDonald/A-110-74-TR (September 1974).
012	Braddock, Dunn, & McDonald and Boeing Co., Addendum to EMP Susceptibility of Semiconductor Components, D224-13042-2 (July 1975).
013	Braddock, Dunn, & McDonald and Boeing Co., Electromagnetic Susceptibility of Semiconductor Components, Final Report (September 1975).

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015	Diode and SCRD.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1970).
016	TransistorD.A.T.A. Book, Derivation and Tabulation Associates, Inc. (1969).
017	SAP-1 Computer Listing. Data as reported in DASA Handbook (1972).
020	Experimental data from DASA EMP Handbook. DASA 2114-1 (September 1968).
021	Estimated data from DASA EMP Handbook. DASA 2114-1 (September 1968).
022	Calculated as per Section III of DNA EMP Handbook (1972).
023	DNA EMP Handbook (September 1975).
024	Joe Miletta, EMP Effects on Components, internal memo, Harry Diamond Laboratories.
025	Joe Miletta, LANCE System Component Damage Characterizations, internal memo, Harry Diamond Laboratories.
026	D. M. Tasca, Submicrosecond Pulse Power Failure Modes in Semiconductor Devices, General Electric Company, Re-Entry & Environmental Systems Division, Document No. 70SD401 (January 1970).
027	D. M. Tasca, Energy-Time Dependence of Second Breakdown in Semiconductors for Submicrosecond Electrical Pulses, General Electric Company, Missile and Space Division, Document No. 67SD7253 (October 1967).
030	D. M. Tasca, J. Peden, and J. Andrews, Theoretical and Experimental Studies of Semiconductor Device Degradation due to high Power Electrical Transients, GE Document No. 73SD4289 (December 1973).
031	Bruno Kalab, Analysis of Failure of Electronic Circuits from EMP-Induced Signals, Harry Diamond Laboratories TR-1615

(August 1973).

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

	TABLE III. DEVICE PARAMETER REFERENCES (CONT'd)
CODE	REPORT
032	G. Baker, EMP Vulnerability Analysis of M-109, M-110 Self-Propelled Howitzers, Harry Diamond Laboratories TR-1797, to be published.
033	G. Baker, EMP Vulnerability Analysis of Radio Sets AN/PRC-77, AN/VRC-64 and AN/GRC-160 (U), Harry Diamond Laboratories TR-1747 (February 1976). (SECRET RESTRICTED DATA)
034	G. Gornak et al, EMP Assessment for Army Tactical Communications Systems: Transmission Systems, Series No. 1, Radio Terminal Set AN/TRC-145 (U), Harry Diamond Laboratories TR-1746 (February 1976). (SECRET RESTRICTED DATA)
035	See Ref 034.
050	J. D. Holder and V. RuweStatistical Component Damage Study, U.S. Army Missile Command Report RG-TR-71-1 (January 1971).
051	Pete Stadler, Failure Threshold and Resistance of the Protected and Unprotected 2N2222 Transistor in the Short Pulse Width Regime, Philo-Ford Corp., U-4976 (May 1972).
052	EMP Electronic Design Handbook, Boeing Aerospace Corporation D224-10019-1 (April 1973).
053	C. R. Jenkins and J. A. Meyers, Integrated Circuits Test Program, Final Report, Word Order 2-14, Braddock, Dunn, & McDonald/A-98-73-TR (July 1973).
054	D. R. Alexander, T. J. Zwolinski, and C. R. Jenkins, Integrated Circuits and Discrete Semiconductor Components Test Program, Technical Directive 4-6, BDM Monthly Progress Reports (January, February, and March 1974).
055	J. S. Smith, Pulse Power Testing of Microcircuits, Rome Air Development Center TR-71-59 (October 1971).
056	The Boeing Company, Memorandum No. 2-6731-0000-C/S-102, Subject: Pulse Damage Data from Integrated Circuits and Electronic Parts (26 September 1973).
057	G. J. Rimbert et al, Resistor Modeling Program, BDM Final Report, ASV Work Order 2-14 [n.d.].
060	See Ref 034.

TABLE III. DEVICE PARAMETER REFERENCES (Cont'd)

CODE	REPORT
061	Data value from our previous data base at MERADCOM.
062	See Ref 034.
063	Forward biased damage constant from graph in DNA Handbook (1972).
064	Weighted average from Ref 013.
065	Averaged from Ref 013.
066	These data are from Ref 034, but conflicting values were obtained from Ref 025.
067	D. Tacsa, J. Peden, and D. Nepveux, Pulsed Power Failure Modes: Conference Proceedings, Component Degradation from Transient Inputs (April 1970).
070	Data derived by averaging the means of data in Ref 067.
071	Data from Ref 034 and 062.
777	UNKNOWN

APPENDIX A . -- JCL FOR EXECUTING DAMTRAC AT HDL

The following is the JCL (job control language) necessary to execute DAMTRAC on the HDL IBM 370/168.

```
DAMTRAC
//JOBCARD
//stepname EXEC FORTPLG, PARM.LKED=LET, COND.GO=(8,LT),
    PRELIB='library name'
//LKED.SYSIN DD *
INCLUDE SYSLIB (TRAC, BLKDAT)
ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO, SPACE=(TRK, (1,1)), DISP=(NEW), DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
       DCB=(RECFM=FB, LRECL=80, BLKSIZE=80), SPACE=(80, (100,50))
//GO.FT11F001 DD DSN='diode library', DISP=SHR
//GO.FT12F001 DD DSN='transistor library', DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN
             DD *
   TRAC piece part data deck
/*
    The following is the JCL necessary to execute DAMTRAC with a user-
written TREAQ subroutine on the HDL IBM 370/168.
DAMTRAC JCL w/TREAQ
//JOBCARD
//stepname EXEC FORTPC
    user written TREAQ subroutine
//stepname EXEC FORTPLG, PARM.LKED=LET, COND.GO=(8,LT),
         PRELIB='library name'
```

APPENDIX A

```
//LKED.SYSLIN DD DSN=&&LOADSET,DISP=(OLD,PASS)
             DD DDNAME=SYSIN
//LKED.SYSIN DD *
INCLUDE SYSLIB (TRAC, BLKDATA)
ENTRY MAIN
//GO.FT06F001 DD SYSOUT=A,DCB=(RECFM=VA,LRECL=137,BLKSIZE=137)
//GO.FT07F001 DD DUMMY
//GO.FT01F001 DD UNIT=VIO,SPACE=(TRK,(1,1)),DISP=(NEW,DELETE)
//GO.FT10F001 DD DSN=&&TEMP,UNIT=SYSDA,DISP=(NEW,DELETE),
        DCB=(RECFM=FB, LRECL=80, BLKSIZE=80, SPACE=(80, (100,50))
//GO.FT11F001 DD DSN='diode library',DISP=SHR
//GO.FT12F001 DD DSN='transistor library', DISP=SHR
//GO.FT17F001 DD DUMMY
//GO.FT50F001 DD SYSOUT=A,DCB=(RECFM=FBA,LRECL=133,BLKSIZE=3990)
//GO.SYSIN
             DD *
```

TRAC piece part data deck

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